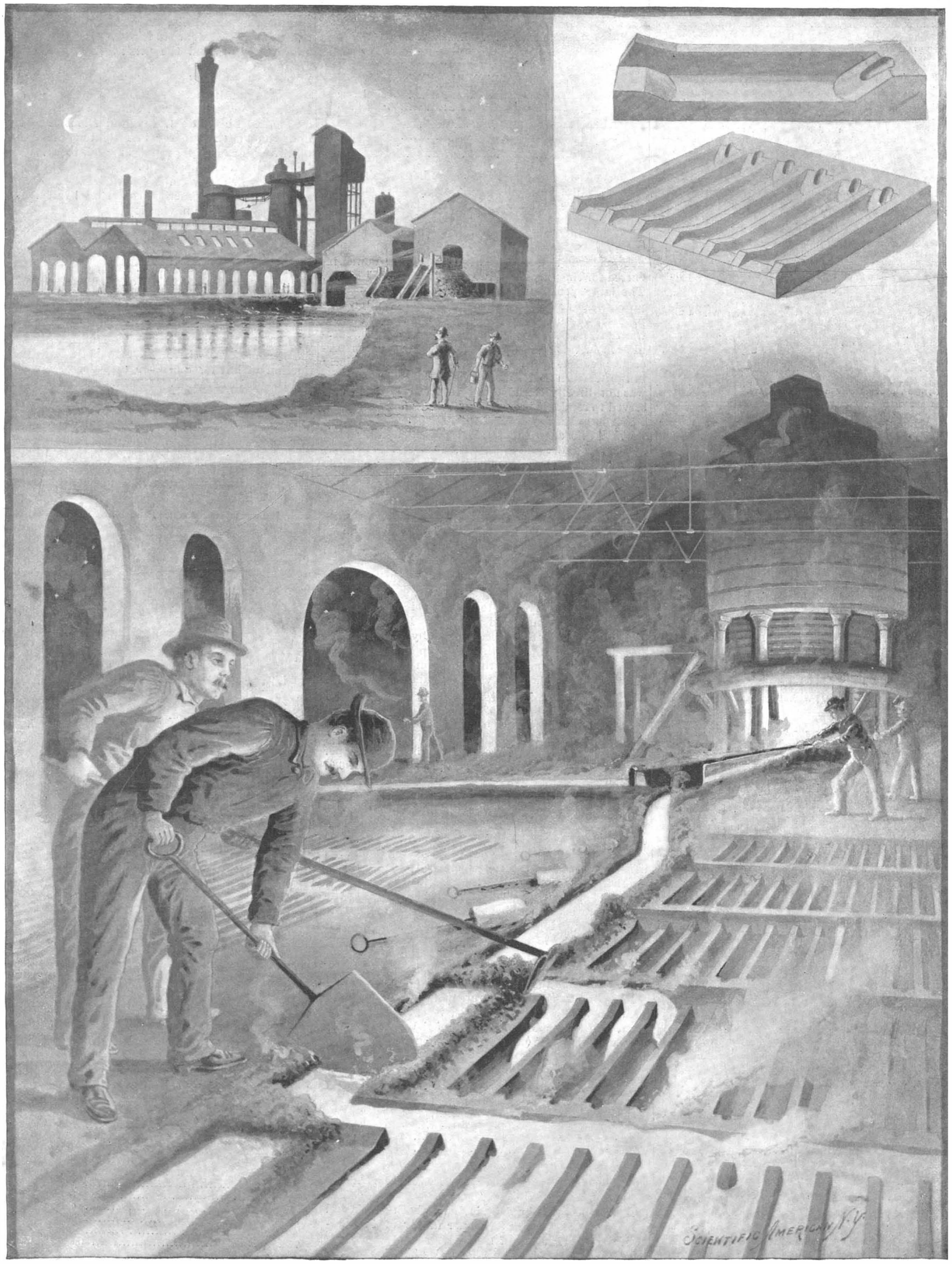
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1895, by Munn & Co.]

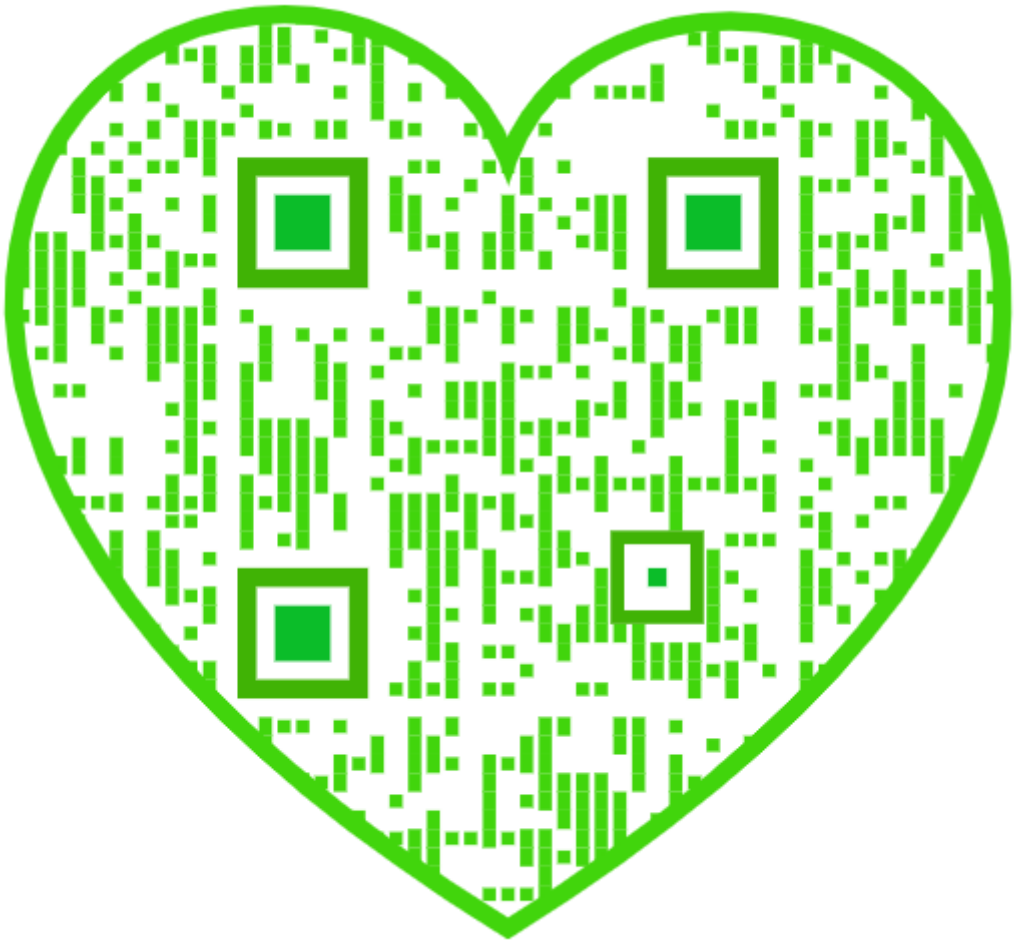
A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIII.—No. 25. [ESTABLISHED 1845.] NEW YORK, DECEMBER 21, 1895 [$3.00 A YEAR. WEEKLY.



THE "ALICE" FURNACE, BIRMINGHAM, ALABAMA.—[See page 391.]

© 1895 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition of Scientific American.

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American,

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 cents.

☞ Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost. MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK. SATURDAY, DECEMBER 21, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural building, Atlanta*.. 393
Archæological discoveries..... 387
Argon, the discovery of..... 391
Asafœtida 390
Atlanta Exposition, the*..... 393
Bicycle brake, Stewart's*..... 388
Bicycle notes..... 387
Boat, Najork's foot-motor*..... 388
Books and publications, new..... 396
Debts, private and public..... 386
Dentistry in Japan..... 390
Diseases, incubation of..... 388
Electric power in New York..... 391
Electric railway street sprinkler*394
Emerald, analysis of..... 386
Fender, car, new..... 389
Fine Arts building, Atlanta*..... 393
Forest, a submerged..... 391
Furnace, the "Alice," Birmingham, Ala.*..... 385
Gold, a substitute for..... 388
Hair worms..... 387
Insect stings remedy..... 390
Incubator, electric*..... 389
Inventions, recently patented... 396
Iron founding, Alabama*..... 385
Ketonic acid..... 387
Lead pencils, manufacture of.... 387
Mars, no water vapor in..... 390
Milk, electrolysis of..... 395
Moon, eclipse of, September 3*.. 395
Navigation, ocean steam..... 386
Notes and queries..... 396
Panama Canal, progress of..... 394
Pasteur Institute farm..... 387
Patents granted, weekly record. 397
Philosophy, the rewards of..... 390
Pneumatic tire, metallic tread for, Growney's*..... 388
Police telephone, Chicago..... 388
Potatoes, experiments with..... 395
Propeller shafts, breaking of.... 394
Railway, pole*..... 389
Rubber stamps, air cushion*..... 390
Savannah, the first ocean steamer*..... 392
Sawyer, Sylvanus..... 391
Sewing machine motor..... 394
Silver from silver bromide..... 388
Skin, artificial..... 394
Spectrum, invisible..... 389
Steam navigation, early history of*..... 392
Stellar systems, dimensions of... 394
Sulphur mining in Louisiana.... 388
Traction engine, Ingleton's*..... 394
Vehicle brake, Davis'*..... 390
War steamer, the first*..... 392
Wasps, suicidal..... 390
Wool for underclothing..... 391

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1042.

For the Week Ending December 21, 1895.

Price 10 cents. For sale by all newsdealers.

PAGE

I. AGRICULTURE.—Lecture on Potatoes.—This article treats of the species and varieties of potatoes, hybridization, the prevention of disease, and grafting.—2 illustrations..... 16659

II. BOTANY AND HORTICULTURE.—Commercial Fibers.—By D. MORRIS.—Lecture I (continued).—This lecture treats of ramie, other nettle fibers, sunn hemp and sida fiber, jute and bibiscus fibers.—3 illustrations..... 16659

III. CIVIL ENGINEERING.—Brighton and Rottingdean Tramway.—A description of this seashore car that runs on a roadbed which is entirely submerged at high tide.—3 illustrations..... 16653
A Novel Brick Chimney.—1 illustration..... 16654
The Making of a Tunnel—The Waterloo and City Railway.—This railway will probably be completed by the end of 1896.—The entire length of the line will be one mile and a half.—There will be no intermediate station.—The engraving shows the Beach tunneling shield in operation.—1 illustration..... 16654
Portland Cement.—By SPENCER B. NEWBERRY.—A report of the annual meeting of the Association of German Portland Cement Manufacturers, giving particulars of a uniform testing apparatus, report of the committee on the influence of magnesia in cement, and report of the committee on the action of sea water on cement and on the process of hardening in Portland cement.—A full paper..... 16649
Railway Signaling.—By WM. MCGRAFTON.—This installment of a valuable paper treats of the construction of interlocking machines, facing point lock and detector bar, electric lock, double point switch and lock movement, slotted signals and compensators.—4 illustrations..... 16653
The Savoyarde—The Bell of the Church of the Sacred Heart, Paris.—A description of this enormous bell, with details of its transportation to Paris by rail and its passage through the streets of that city.—Fully illustrated by diagrams of the bell and mounting and engravings of its transportation.—7 illustrations..... 16647

IV. ELECTRICITY.—Electric Registering Water Level Indicator.—A detailed description of an elaborate system for registering water levels at a distance.—4 illustrations..... 16655

V. METALLURGY.—Notes on Gold Milling in California.—By ED. B. PRESTON.—Mill details.—This article treats of mill details and is fully illustrated.—25 illustrations..... 16656

VI. MISCELLANEOUS.—Collisions Between Steamers and Whales.—This article gives an account of various collisions between whales and ocean steamers.—1 illustration..... 16658

VII. TECHNOLOGY.—The Commercial Manufacture of Liquid Air and Oxygen.—3 illustrations..... 16650
Manufacture of Photographic Plates.—An illustrated article, giving details of the cutting of the glass for the plates, the cleaning of the glass, the preparation of the emulsion, the coating, drying, and packing of the plates.—2 illustrations..... 16651

VIII. VETERINARY SCIENCE.—Investigation of Bovine Tuberculosis, with Special Reference to its Existence in Iowa.—An interesting and important paper, giving the method of applying the test and giving the result of experiments, how the affection is extended, what are the symptoms of the disease, the relation of meat and milk supply to public health, etc..... 16661

PRIVATE AND PUBLIC DEBT IN THE UNITED STATES.

The production and trade of a country necessitate an elaborate system of debts and credits which increase proportionately to the magnitude of its commercial operations.

According to the Official Bulletin, the minimum private and public debt of the United States for the year 1890 was $20,227,170,546. Of this sum, $6,200,000,000 represents the debt of quasi public corporations, under which head are included railroad companies, street railways, telegraph, public water, electric and gas companies, etc., 91·44 per cent of this, or $5,669,431,114, being the debt of the railroad companies alone.

The debts of individuals and private corporations reach a total of $12,000,000,000, divided as follows:

Real estate mortgages	$6,019,679,985
Crop liens in the South	300,000,000
Crop liens outside of the South	350,000,000
National banks, loans, etc	1,904,167,351
Other banks, loans and overdrafts	1,172,918,415
National, State and local taxes	1,040,473,013
Other net private debt (estimated)	1,212,761,236
Total private debt	$12,000,000,000
Total for public corporations (as above)	6,200,000,000
Total	$18,200,000,000

The public debt, less sinking fund, in which debt is included that of the United States, States, counties, municipalities and school districts, is $2,027,170,546, which, added to the private debt, makes a total of all kinds for the country of over twenty billions.

It is significant that over 58 per cent of the combined debt on farms and homes occupied by owners was incurred for the purpose of the purchase of real estate. The large profits which were realized by the earlier purchasers or original owners of inside and outside property in and around the rapidly growing cities of the States encouraged an abnormal amount of speculation in this direction during the few years preceding the late crisis. In the middle, and particularly in the Western States, this form of speculation, if it was not directly contributory to the crisis, certainly served to render it very acute when it came.

The crop liens of the South are a legacy of the civil war. At its close the farmers possessed their land and a few mules and tools, but no money. The merchants furnished supplies in consideration of crop liens and mortgages on farm stock. The system thus begun has continued to the present day.

The loans from banks are obtained on the understanding that they are for capital.

The tax debt and the public debt are incurred "for the maintenance of justice, the promotion of public works and for education."

From the above categorical view of the various kinds of debt that go to make up the total for the country, it is seen that fully nine-tenths were incurred in the acquisition of capital and property. Less than one-tenth represents "debt necessitated by misfortune."

Next in importance to the question of the amount of debt of the country is the question of the rate of interest upon which the various loans were granted. The average rate of interest on railroad debts is 4·50 per cent; on street railways, telegraphs, etc., 5·89 per cent; on real estate mortgages, 6·60 per cent; bank loans and over-drafts, 6·60 per cent; crop liens outside the South, 10 per cent; crop liens in the South, 40 per cent; making an average rate on private debts of 6·67 per cent.

The rate on the United States public debt is 4·08 per cent; and on States, counties, and municipalities, 5·29 per cent. The average rate of interest on the total indebtedness of the country is 6·44 per cent.

Referring to the ruinous rate of interest paid on crop liens in the South, the report states that "extensive inquiries, answered by merchants and cotton buyers, who hold crop liens, point to the conclusion that the average rate on these liens must be as high as 40 per cent, rarely going as low as 25 per cent, and often going as high as 75 per cent and more"!

The relatively low rate of 4·08 on the debt of the United States is partly explained by the fact of its exemption from taxation.

Referring to the average rate of interest of 6·60 per cent on real estate mortgages, it should be noted that, in the case of farms occupied by owners, this rises as high as 7·07 per cent and 7·36 per cent on acre tracts.

The percentage of debt to wealth is for:

Railway companies	67·48 per cent.
Street railways and telephone companies	66·60 "
Incumbered farms occupied by owners	35·55 "
Incumbered homes occupied by owners	39·77 "
Taxed real estate and untaxed mines	16·71 "
The whole United States	31·10 "

The total wealth of the United States corresponding to the total debt of over $20,000,000,000 is about $65,000,000,000.

The total per capita debt, including both public and private debt, is $323, or $1,594 per family of 4·93 persons, as per the census of 1890.

In connection with the above classification of the various forms of indebtedness, public and private, it is satisfactory to learn that there was a total increase of wealth, during the ten years from 1880 to 1890, of $21,395,091,197; the increase for the year 1889 to 1890 being nearly three billions of dollars.

NEW YORK THE BIRTHPLACE OF OCEAN STEAM NAVIGATION.

Doubtless the majority of the readers of the SCIENTIFIC AMERICAN have a more or less distinct impression that New York was in some degree associated with the development of the first steamboat; but it will, no doubt, be a pleasant surprise to learn that this city has a threefold claim to be called the cradle of the steamship. The first practical river steamer, the first vessel propelled by steam to make a deep sea voyage, the first transatlantic steamship, and the first steam warship, all owed their existence to the inventive genius of New York designers and the practical skill of New York craftsmen.

In drawing attention to this interesting coincidence, we would not detract from the fame and credit due to the earlier inventors of the sixteenth and eighteenth centuries. Blasco de Garay and Denis Papin were undoubtedly the pioneer investigators of the possibilities of steamship propulsion, and, to a certain extent, they proved its possibility; but the mechanical forms in which they embodied their ideas were crude and possessed no practical commercial value. While the theory of steam navigation was old, centuries old, it required some master mechanic to embody this idea in practical, mechanical shape, and this was what Robert Fulton, associated with R. Livingston, accomplished, when, on August 7, 1807, he saw his first steamer, the Clermont, cast off her moorings at the New York docks and start on her maiden trip to Albany.

To Colonel John Stevens, and, indirectly, to a monopoly of navigation on the Hudson, granted to the owners of the Clermont, New York owes the distinction of having built the first deep sea steamer; and the credit of building the first steamer to make a transatlantic passage is shared by New York conjointly with Savannah, Ga. The Savannah having been built at New York and engined at the Southern seaport.

Of scarcely less historic interest than the Clermont is the battle ship Fulton the First, which was named after the designer, and testifies yet further to his inventive genius.

Like the other pioneer ships in their respective classes, the Fulton was built in New York ship yards, and thus clearly establishes this city's claim to be called the cradle of the modern steam battle ship.

A cut of the original plans for this vessel will be found in the SCIENTIFIC AMERICAN SUPPLEMENT for April 21, 1894. The dimensions of this vessel prove that Fulton had the courage of his convictions, for her displacement was greater than that of the average three-decker of that period, and considerably over that of the Victory, which carried Admiral Nelson at the battle of Trafalgar.

The Fulton the First showed a trial speed of over 6 miles an hour, which was far above the average, day in and day out, speed of the fleetest sailing frigates of those times.

In many details she anticipated the modern war ship; as, for instance, in the provision that she should be "furnished with four submarine guns, to discharge a hundred pound ball into an enemy, ten or twelve feet below her water line." The cross section shows that her engines and boilers were placed low down in the hold, and that the portion above the water line was protected by side armor of 5 feet of oak, an amount which was certainly impenetrable by the ordnance of that date.

It is unquestionable that, with her greater maneuvering power, her 100 pounder guns, and the superior protection afforded to the gunners, she would have proved more than a match for the best ship of the line of that date. The close of the war of 1812 prevented her from testing her strength against the English ships; but tradition has it that the appearance of this 2475 ton monster, gliding swiftly down the bay, with no visible means of propulsion, struck terror into the "indomitable heart" of the British tar!

Analysis of Emerald.

The author has operated on the emerald of Limoges (Chanteloube, Haute Vienna). He gives the following results:

	I.	II.
Loss at a red heat	1·46	1·41
Silica	66·06	65·80
Alumina	16·1	16·40
Glucose (? should be glucina)	14·33	14·21
Ferric oxide	1·2	0·9
Mn_3O_4	—	—
Magnesia	0·55	0·61
Lime	0·17	0·14
Phosphoric acid	0·11	0·09
Alkalies	—	—
Titanic acid	traces	traces
	100·11	99·67

—P. Lebeau.

© 1895 SCIENTIFIC AMERICAN, INC.

Cycle Notes.

All cyclometers should be provided with some means of correction. It is nothing unusual to find them from three to five per cent out, owing, very likely, to the varying diameter of the wheel, depending on whether the tire is fully inflated or not. A new cyclometer is on the market which registers not only 10,000 miles, but has also a special dial for indicating the miles made on a single trip. Another dial marks the fraction of a mile.

November 22 the doors of the Agricultural Hall, London, were thrown open for the nineteenth cycle exhibition, in the name of the Stanley Club. An eager crowd of visitors was immediately admitted to mark the improvements, alterations, and innovations that were proposed for cycles and their accessories for next season's mounts.

The Simpson lever chain was one of the first of the exhibits to receive long and careful attention.

The auto-cars, the bi-tricycles and the motor cycles next received a due share of rapt attention, public interest after these exhibits had been visited becoming more general and spreading itself out impartially over the various mechanical devices thought out by the different firms and brought together under one roof by the enterprise and perseverance of the Stanley show promoters.

There are, comparatively, but few three-wheelers on exhibition, and even these few, beautifully constructed and finished as they are, receive but scant notice. There is no doubt about the matter that the bicycle is the machine for both men and women.

One of the many interesting features introduced was the display of many forms of dress considered suitable for cycling.

The extensive photographic collection in the gallery attracted attention. It is becoming more and more popular for the snap shot photographic apparatus to be numbered among the ordinary necessaries of the cycling tourist's outfit, and the enlargements exhibited as the result of snap shot photography certainly suggest that the art is one that is to become of far more widespread interest than it is, even at the present stage of photographing enthusiasm. One of the great attractions of the Stanley has proved to be a machine shown by the makers of the Gladiator, boasting a 2½ inch tread.

The relay ride from Washington to New York City was ended Monday morning, December 2, in New York, at 4:48 o'clock, when Lieutenant Libby and Private Pilkin delivered to Lieutenant Donovan, on Governor's Island, the message from General Miles, who started it from Washington, Sunday, at 7 o'clock in the morning.

The roads were execrable, the riders say, and it was often almost impossible to remain in the seat. Each rider carried ten rounds of ammunition and the regulation army pistol. The uniform consisted of a blouse, campaign hat, gauntlet, gloves and bloomers.

The race was suggested by General Miles, who is making severe tests of the bicycle in the hopes of having it generally adopted in the army. It would have been difficult to have selected a harder ride than was taken by these men, and the wheels, in each instance, stood up remarkably well.

Manufacture of Lead Pencils.

The Monde Economique, quoting from a work recently issued by Ernest Faber on the manufacture of lead pencils, published on the occasion of the business of Johann Faber, of Nuremberg, being turned into a limited company, says that there are twenty-six manufactories of lead pencils in Bavaria, twenty-three of which are at Nuremberg. These employ 9,000 or 10,000 workmen, and turn out 4,400,000 lead pencils every week. In the above number of workmen are not included turners, boxmakers, etc. The factory of Johann Faber alone turns out 1,280,000 pencils per week. The protective customs duties of the United States prohibit the importation of cheap pencils, and this country itself turns out almost as many pencils as all the Bavarian factories put together. The best cedar wood of the States (Cedrus virginiana) will soon be exhausted, but at present, having the monopoly of internal production, a considerable amount is exported to India, Mexico, Japan, and Australia, at extraordinarily low prices. The duties in Italy (100 lire per 100 kilogrammes), in France (180 to 300 francs per 100 kilogrammes), and in Russia (35 copecks per pound) are also hindrances to importation. In France, it is stated that schools and government offices, and even railway companies, are forbidden to buy German pencils.

In the United States excellent lead pencils are now being made of paper, which is wound spirally upon the lead.

The Blacksmith.

In our description of this celebrated painting, in our last week's issue, we regret to note that the address of Mr. F. E. Galbraith, the owner of the painting, was omitted. The picture can now be seen at No. 19 West Twenty-fourth Street, New York, where we understand it is to remain for some time.

Hair Worms and Their Hosts.

BY HARRY MOORE.

At Betchworth, Surrey, just where the road crosses the River Mole, I picked up a specimen of Pterotichus madidus, Fab., from which, upon being placed in the cyanide bottle, a Gordius aquaticus, L., endeavored to escape. About three inches of it extrude, and, judging by its girth, an equal or greater length remains inside, yet the abdomen of the beetle is but nine millimeters in length.

Nearly every observer of the slightest experience has some acquaintance with hair worms, even if it is only a hazy recollection of the horse hair legend of his school days. Numerous notes are scattered through the early volumes of Science Gossip and a further one upon the variety of the hosts Gordius infests may not be unacceptable. The family Nematoidæ, to which the Gordiaceæ belong, contains many species of more than ordinary interest, first on account of their curious cycle of development, and then their value in the economy of nature, for not only are they in a measure beneficial in checking over-production in certain insects, but more or less dangerous when introduced into the human system. Their life history may be briefly described as follows: The eggs are laid in long strings; upon hatching, the young larva bores through the membrane, and for a short period lives a free aquatic life. It then becomes parasitic upon various fly larvæ, etc.; these hosts in their turn are devoured by other creatures, and the worms become incepted in their intestines, where they remain some months, finally making their way into the intestinal cavity and escaping per ano in due course.

It is rather singular, however, that, whereas hair worms are most commonly found infesting beetles in England, they prefer the orthoptera (grasshoppers and allied insects) in America. In both countries spiders have been noted as hosts, in America the human being, and an instance has come under my own notice where there was strong presumptive evidence the worm had been voided by a sparrow. Various writers cite fishes and frogs, and several mention caterpillars, but the parasites observed in lepidopterous larvæ probably belonged to the allied genus Mermis. In America, Mermis acuminata, Leidy, has been observed in the larvæ of the codlin moth (Carpocapsa pomonella, L.) and a similar parasite has been seen in larvæ by several of our London workers.

In enumerating the hosts of Gordius aquaticus, the common European hair worm, several difficulties arise, for whereas, as I have already mentioned, carnivorous beetles are chiefly infested this side of the Atlantic, the observers do not always seem to have determined their species. Several references of this sort will be found in Science Gossip (vol. i, page 198, vol. xii, page 71, vol. xv, page 281, etc.) If any of our present readers can furnish something more definite, we shall be able to get along with our list. I have come across no mention of coleoptera being infested in America, in any note to which I have access; but the following are some of the authenticated instances among the orthoptera:

G. aquaticus has been found in the cricket (Gryllus neglectus) and in Acheta abbreviatus, Serville—the short winged field cricket found in woods beneath logs and stones; Gordius robustus, Leidy, infests Stenopelmata fasciata, Thomas, one of the stone or camel crickets usually found beneath stones and along the margins of woodland streams and logs, and in damp woods (Blatchley), and Orchelimum gracile, a grasshopper confined to low moist meadows; A. Gordius (species ?), eight and a half inches long, has been taken from a pupa of Xiphidium ensiferum, Scudder, whose perfect body measures but half an inch in length. The life history of this orthopteron is of exceptional interest, the ova being deposited from several up to one hundred and seventy "in the turnip-shaped galls produced by a small fly belonging to the Cecidomyidæ on certain species of willow (Salix cordata, etc.)"

I have now but to mention Caloptenus spretus, Thomas, the Rocky Mountain locust, which is infested with G. aquaticus, Linn., and G. varius, Leidy, although repeated dissections by various American observers (Riley, Whitman, etc.) have shown that not more than a small percentage of the locusts are infested, yet when we consider the loss incurred annually in the United States from locusts alone is estimated at £8,000,000, anything which tends to mitigate the plague becomes of importance.

The question, How are we to account for the presence of these aquatic parasites inside terrestrial insects? upon consideration, is not of easy solution. Of course they are introduced with their food while in a minute immature state, but whether as ova or larvæ I think there is room for discussion. It will be noticed all the insects mentioned are associated with damp places that are more or less subjected to floods; but I don't think that sufficient reason for believing they have all fed upon the various aquatic fly larvæ in which the hair worm larvæ are said to pass their first period of larval life, though in the case of grasshoppers Packard thinks they swallow them as larvæ. I am inclined to believe there are several points in the life history of these parasites yet to be cleared up; perhaps some of our microscopists can elucidate them.—Science Gossip.

Archæological Discoveries.

Another ancient Greek hymn set to music, recalling the discovery made in the latter part of 1893 (vol. iii, page 866, of Current History, published by Garretson Cox & Company, Buffalo, N. Y.), has been brought to light by the French excavations at Delphi. It is inscribed on two large slabs of stone, which have been unearthed in the building described by Pausanias as the "Treasury of the Athenians."

The find of 1893 included fourteen fragments of various sizes, four of which were distinguished from the others by a difference in the notation of the music. These four were introduced to the public last year as the "Hymn to Apollo" (vol. iv, page 251). The latter find includes another large fragment, to which the remaining ten of the first discovery can be adjusted, thus giving us a second hymn. The decipherment and transcription of the words and music have, as before, been intrusted to MM. Henri Weil and Theodore Reinach.

The purport of both the hymns is substantially the same. After an invocation of the Muses, the poet gives various legends of Apollo's life and works, ending with the slaughter of the Gauls at Delphi in 279 B. C.; and then implores the god's protection for Delphi and Athens and the government at Rome. The date is, therefore, after 146 B. C., when the Romans took possession of Greece. Apart from the music, the hymns are not particularly interesting.

The duration of the musical notes is indicated by the syllables that were sung with them. Thus, for example, where three notes are attached to a word of one long syllable followed by two short syllables, they answer roughly to a crochet followed by two quavers. The pitch of the notes is indicated by various letters of the alphabet. In the first hymn the letters were those that the Greeks prescribed for use with voices; but in this second hymn they are those that were prescribed for use with instruments. As the Delphians would not likely have written down the accompaniment and omitted the song itself, it is supposed that the instruments and voices were here in unison.

A discovery of importance for the history of early Christian literature is credited to Dr. Karl Schmidt, of Cairo, Egypt. In the library of the cloister of Ackmim—the same library in which the Gospel and the Apocalypse of Peter and Apocalypse of Elijah were found—Dr. Schmidt recently came across an old Coptic manuscript containing a record of conversations between Christ and his disciples. Both the beginning and the conclusion have been lost through mutilation of the manuscript.

The chief subject of conversation is the resurrection of Christ, which is reported in detail and in such a manner as to combine the narratives of the four gospels. The object of the writing is to warn the reader against unbelief, especially gnosticism. There is a long discussion of the resurrection of the body. The work shows itself to be an apocryphal missive of the apostles to the congregations, and reveals the congregational orthodoxy in the early church. Like the Apocalypse of Peter, it shows also that the church was not always able to resist the temptation of following the gnostic trend of thought. Its date, approximately, is 160 A.D.

The Pasteur Institute's Farm.

The New York Therapeutic Review says that a farm of about 200 acres of land, in the vicinity of Tuxedo Park, New York, one hour's ride from the city, has been purchased for use as an experimental station for the New York Pasteur Institute.

The farm, which is already provided with ten cows and the antitoxin horses and mules of the institute, will receive in addition many donkeys, goats, sheep, dogs, rabbits, guinea pigs, etc., for which especial barns are now being built, and also a laboratory for the preparation of the antitoxic serums, vaccine virus and other biological products.

Research will be conducted there upon infectious diseases of animals as well as of man.

The extensive character of the work done at the institute rendered indispensable the establishment of this experimental station.

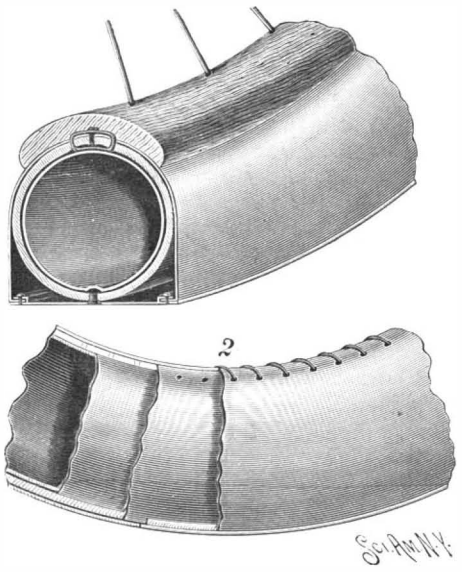
Synthetic Formation of a New Ketonic Acid.

The compound in question has been obtained by the action of camphoric anhydride upon benzine in presence of aluminum chloride. Its composition is $C_{15}H_{20}O_2$. It forms white crystals of a nacreous luster which melt at 135—137° and boil at 320° at a pressure of 760 mm. They are almost insoluble in water, sparingly insoluble in ligroine, but readily soluble in acetic acid, alcohol, ether, benzine, chloroform, and carbon disulphide. The author has formed and examined its ammonium, barium, silver, copper, cobalt, nickel, zinc, and lead salts. He has also obtained its ethylic and methylic ethers, its anhydride, amide, and hydrazide.—E. Burker.

© 1895 SCIENTIFIC AMERICAN, INC.

A METALLIC TREAD PNEUMATIC TIRE.

A tire having a metallic tread secured to the tubular inflated rim, obviating the liability to puncturing the tire or other injury when the wheel passes over sharp objects in the road, is represented in the accompanying illustration, and has been patented by Frank M. Growney, of No. 986 Washington Avenue, New York City. The tubular rim is secured in the usual manner to the felly, and the metallic tread, consisting preferably of a continuous strip of mild steel, is attached to the outer part of the rim by rivets, as shown in Fig. 1, the outer sides of the tread being engaged by the sides of bands fastened in place by clamping strips. The

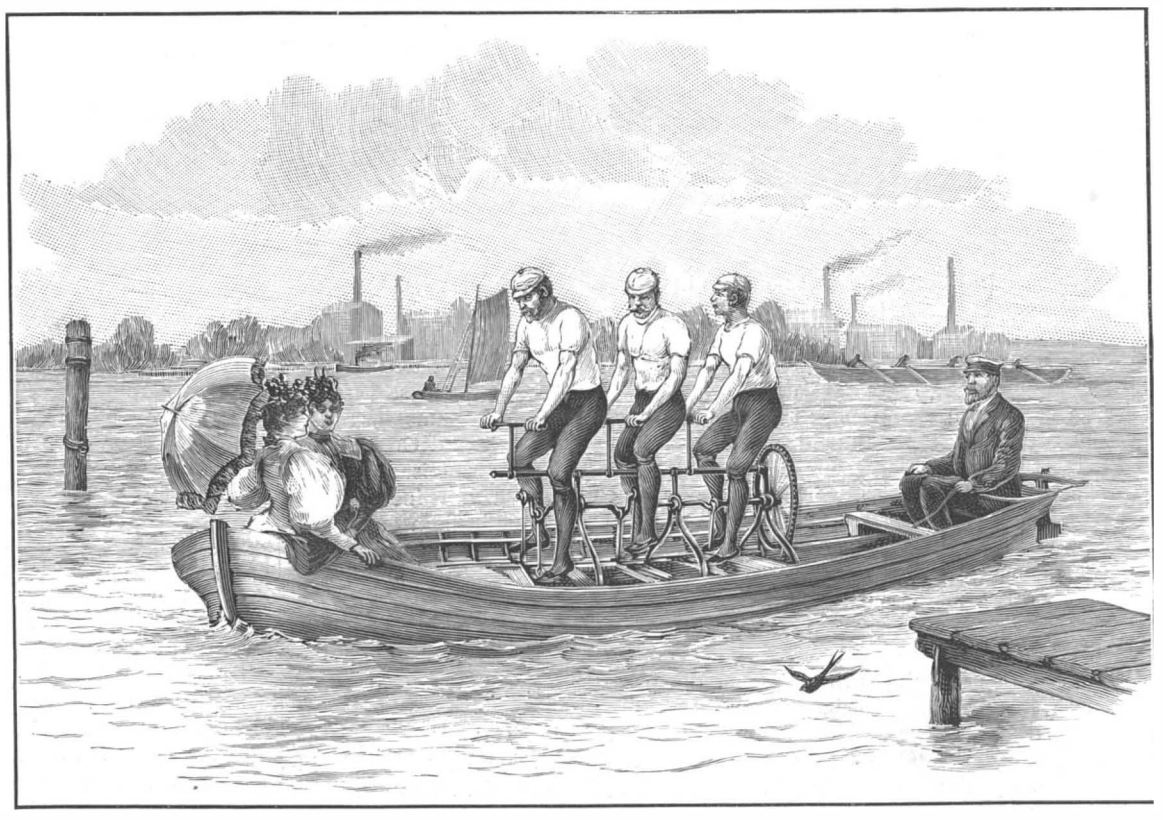


GROWNEY'S PNEUMATIC TIRE.

bands extend around the sides of the rim, and are connected by the usual lacing with the inner ends of the rim, the lacing also attaching the inner ends of the rim to each other. Fig. 2 is a side sectional view of the improvement. The rim, as will be seen, is protected by the side bands, as well as by the continuous metallic strip forming the tread.

NAJORK'S FOOT MOTOR BOAT.

Just now, when so many are devoting their time and attention to the various means of transportation, trying to discover the quickest way of moving us mortals from one place to another over both the land and the sea; when steam, electricity, petroleum, benzine, etc., have entered the lists against the muscles of the horse, and even of human beings, we are sure that our readers will be interested in the motor shown in the accompanying engravings, for which we are indebted to the Illustrirte Zeitung. This boat is propelled by a screw driven by foot power, and is operated by three people, the one nearest the stern also steering. The wheel visible behind the last operator transmits motion to the shaft and through the latter to the propeller. By various arrangements of the three cranks dead centers can be avoided. For every 60 movements of the treadles the screw revolves 500 times. In this way even unskilled operators can travel about five miles an hour. A great advantage of this boat is that it can also be propelled by oars or sails, and the simple apparatus can be applied to any boat that is sufficiently broad. As the three operators sit quite high, a counter weight of lead should be placed in the keel. The Najork boat has created quite a sensation in boating circles.



NAJORK'S FOOT MOTOR BOAT.

The Chicago Police Telephone System.

Chicago has a complete telephone and signal system, consisting of 887 public and 370 private boxes, operating on 81 circuits, connected with the 37 precinct stations of this department, in which they are located. The system includes public sentry boxes placed at street intersections, equipped with a signal box to transmit the number of the station; a telephone for patrolmen to report and receive orders over; a chemical register at the station which records the calls, and the necessary switches for operating the telephone and testing for electrical disturbances.

Silver from Silver Bromide.

Silver is usually recovered from silver bromide wastes, incident to photographic processes, by mixing them with nine-tenths their weight of calcined sodium carbonate, and fusing in a crucible, whereby carbon dioxide and oxygen are given off. Metallic silver gathers at the bottom of the crucible, and a double salt of sodium carbonate and sodium bromide floats on top as a clear liquid. On cooling the crucible down to a red heat the silver solidifies, and the flux, still in a liquid state, may then be easily poured off. The silver thus obtained is of a fine white color. The flux usually has an intense yellow color and still contains about 10 per cent of silver. The latter may be obtained (Pharm. Centralh., xxxvi, p. 632) by mixing the flux with plenty of water and stirring occasionally to facilitate solution of the flux. The unchanged silver bromide is allowed to settle, washed by decantation, and preserved for a subsequent operation.

Sulphur Mining in Louisiana.

The Mineral Collector says: The Standard Oil Company has finally solved the great problem, on which hundreds of thousands of dollars have been spent in vain, of getting at the immense mass of sulphur which lies some hundreds of feet below the surface in Calcasieu Parish, Louisiana. For thirty-five years company after company has experimented with this deposit of sulphur, which is probably the largest in the country, and is valued at from $30,000,000 to $100,000,000. There was no doubt about the sulphur being there, but unfortunately between it and the surface lay an immense quicksand, which could not be removed, excavated or bored through. There was no way of man reaching the sulphur and getting it up. A small town, Sulphur City, has grown up in the neighborhood of the mines, at which lived the operatives engaged in trying to solve their problem. As the expenses of these employes had to be paid, and as not a pound of sulphur was obtained, the several companies organized to mine it went, one after another, into bankruptcy, until the property fell, a short time ago, into the hands of the great Standard Oil Company.

Long before the discovery of petroleum in Pennsylvania a party of hunters stumbled on a petroleum spring in Calcasieu. The Louisiana Petroleum Company was organized to mine for it, and while mining discovered that side by side with the oil was one of the most valuable deposits of nearly pure sulphur in the world. The sulphur was 400 feet below the surface and extended below 800 feet further. There was no doubt or question about this, but, unfortunately, just above the sulphur was a quicksand 160 feet thick. One effort after the other to reach the sulphur failed. The drill struck an underground well, then a gas well. After several deaths the American Sulphur Company gave up the enterprise. Then a Belgian engineer undertook the work and endeavored to neutralize the quicksand by freezing it solid and boring it through, and erected valuable refrigerating machinery for that purpose, but the quicksand would not stay frozen and that system of mining had to be abandoned.

Within the last few weeks the Standard Oil Company has got control of the property. It set about mining in a fashion the very opposite to that of the Belgian engineer. Instead of using freezing as the means of getting at the sulphur, it is trying heat. Superheated water is forced through ten inch pipe on the sulphur, melting it, and the liquid sulphur water is then pumped up. A little exposure to the air, so as to evaporate the water, leaves almost pure sulphur. The experiment has been a success beyond expectations.

AN IMPROVED BICYCLE BRAKE.

The illustration represents a very simple and inexpensive brake, which by a slight modification may be adapted for use as a foot brake, and which is designed not to cut or wear the material of which the tire is made. The improvement has been patented by William L. Stewart, of Wilmerding, Pa., and the illustration represents the device separately and as applied on a wheel. The brake frame is of metal, and carries two flanged rollers on which is tightly stretched a rubber band, the brake being attached to a stem which extends up the steering head. When the brake stem or rod is forced downward in the usual way, the band bears with corresponding pressure on the wheel tire. The inventor has also provided a construction by which one of the rollers carrying the band is adjustable, and may be moved outwardly, if desired, to increase the tension on the band.

STEWART'S BICYCLE BRAKE.

Incubation of Diseases.

According to investigations made by the Clinical Society, London, the period of incubation for diphtheria does not, as a rule, exceed four days, and is more often two, though it may also extend to five, six or seven; the infection may take place any time in the course of the disease, and mild cases may spread it. In the case of typhoid fever, this may vary within wide limits, twelve to fourteen days, but not infrequently less, and, as the disease is usually introduced into the system by food and drink, it is not carried from one person to another, but several may get it from the same source, contaminated water and milk being the usual causes. Epidemic influenza, or "grippe," has for its incubation period a few hours to three or four days, generally striking suddenly and without warning, and a patient may carry infection thoughout the whole course of the disease. Mumps have an incubation period of from one to two weeks and the chances of infection diminish daily. In the case of measles, the period is usually short, being counted from the date of the eruption, which decides the disease German measles have a long incubation period, and the infectivity diminishes in a day or two after the disappearance of the rash.

A Substitute for Gold.

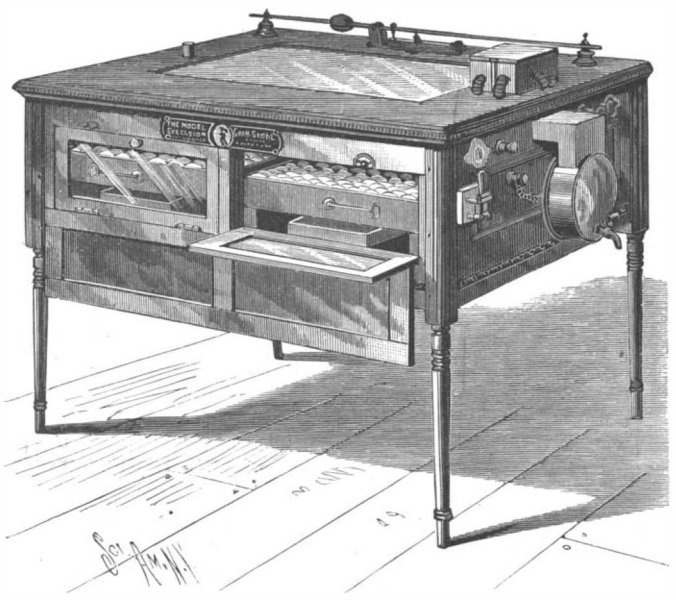
A French journal describes a new and promising substitute for gold. It is produced by alloying ninety-four parts of copper with six of antimony, the copper being first melted and the antimony afterward added; to this a quantity of magnesium carbonate is added to increase its specific gravity. The alloy is capable of being drawn out, wrought, and soldered just as gold is, and is said to take and retain as fine a polish as gold. Its cost is a shilling a pound.

© 1895 SCIENTIFIC AMERICAN, INC.

AN ELECTRIC INCUBATOR.

A successful manufacturer of incubators, Mr. George H. Stahl, of Quincy, Illinois, has recently placed on the market an incubator which is heated and regulated by electricity. In this incubator, which is shown in the accompanying illustration, it is said that the temperature can be adjusted to be held for weeks within a fraction of a degree of the desired point. The incubator casing has the usual double walls inclosing a filling of mineral wool, and the heat is supplied from the water tank at the top, the heating and setting up of a circulation in the water being effected through a small connected reservoir at one side. In the old style incubators the heating of the water was effected by a lamp, there being a lamp regulator controlling the flame, and a valve regulator acted upon by the heat of the water before entering the tank, while both regulators were actuated by an improved thermostat.

In the electric incubator, or "Electric Hen," as it is called, the water is heated by a resistance box, the current through which can be regulated with extreme nicety. The same manufacturer is now also building an incubator with a combination heater in which oil, gas or electricity may be used.



STAHL'S EXCELSIOR ELECTRIC INCUBATOR.

A New Car Fender.

The invention of Mr. Wm. B. Altick, of Lancaster, Pa., is so arranged that the instant the front padded bar strikes a person, an inside gum roller connected with the safety netting drops automatically on the track, thus rendering it impossible for the object struck to pass under the fender. If a person when struck should fail to fall into the netting, and fall in front, the additional pressure of the moving car against the body would cause the front cushioned bar to drop also, and would push the body along the track until the car was stopped. The person might be bruised or otherwise injured, but the danger of being crushed under the wheels would be obviated.

A POLE RAILWAY.

We give a picture, from Black and White, of a picnic party celebrating the opening of a pole railway in the province of Nova Scotia. It is a novel line, thirteen miles in length, and is the third of its kind in the province. For the most part it is utilized in bringing the deposits of silica found in the lakes down the mountains to shipping ports. The way is of spruce poles. The engine has sufficient power to draw four empty cars up the heavy grade of the railway. By taxing the motor to its utmost, and by a liberal use of sand on the rails, eighty excursionists were taken up the incline on the occasion represented.

The pole railway is probably the most economical form of steam roadway that has been produced. It is of American origin and has been in vogue in different parts of the country for the past quarter of a century.

It is especially adapted for use in forest regions, where lumbering is the principal industry.

A first class, substantial road built of poles will cost anywhere from seventy-five to two hundred and fifty dollars per mile, according to local circumstances. The expense, of course, is greater when the road has to be carried across ravines, as indicated in our engraving. The poles employed for rails should not be less than nine inches in diameter at the smaller end, and should consist as far as possible of the heart, or they will decay before they wear out.

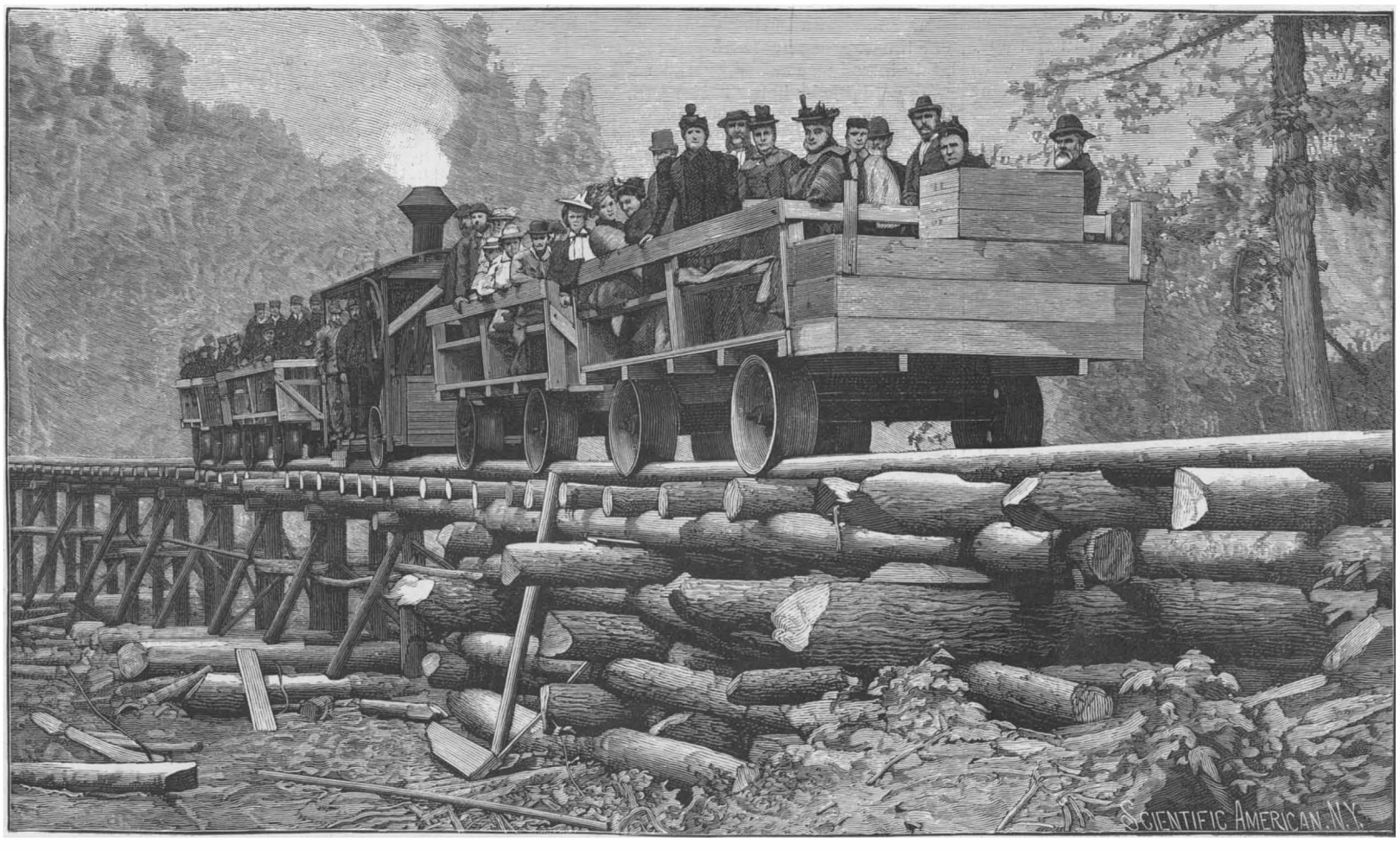
In the best roads, a bed is hollowed out in the butt end of the pole to receive the small end of the one adjoining, so as to make a secure junction. The bed is made about nine inches in length and deep enough to permit the smaller end to come up flush with the larger. The poles are simply laid on top of the ground, except when the surface is very uneven, dirt thrown on each side and trampled down to form a solid bed. After they are in place, they are slightly trimmed down with an adz. When a crook of any kind occurs in the poles, it is of course turned down in laying the track. No cross ties are necessary, as the locomotives and cars are so constructed that they exert no lateral pressure. After a few trains have passed over the road there is no fear of the poles becoming displaced. Curves are made up of a succession of short poles, care being taken that the joints come opposite to each other. The switching is readily accomplished in the ordinary way. Where heavy grades are encountered, it is the practice in some localities to place the locomotive in the middle of the train, and at the particularly steep grades to cut away half the train, push up the other half, uncouple, and return for the remaining cars. In this manner, trains of six loaded cars have been taken over grades of 700 feet to the mile with the use of only one locomotive. The wheels of the cars and locomotives have very broad treads deeply grooved, so as to fit the curvature of the poles.

The Invisible Spectrum.

It is known to all students of science that the band of colored light produced by a prism, through which sunlight is passing, appears to stop with dark red rays one way and with deep violet rays in the opposite direction. Much interest has been awakened by attempted study of this color band thought of as going below the visible red end and above the ultra violet. In a recent lecture before the Royal Institution, Dr. William Huggins spoke of these points and the methods of study of them now in use, as follows:

"Beyond the violet end of the spectrum there is a whole gamut of invisible rays, which only reveal themselves by their effect in promoting chemical action. Similarly, beyond the other end of the visible scale—the deep red—there is a gamut of invisible or dark rays, which are only perceived by their heating effects. Some idea of the importance of the 'ultra red' may be gathered from the fact that it has been traced to a distance nearly ten times as long as the whole range of the visible or light-giving region of the spectrum. To learn the character of these mysterious dark rays, then, it is clearly necessary for science to fit itself with some new sort of eyes that can see what ordinary eyes cannot—namely, heat rays and chemical rays. The photographic plate has answered admirably as an eye for the chemical rays, and brought out some wonderful facts. But with the invisible heat rays the problem was more difficult. Something in the nature of an extremely delicate thermometer is here required, which will pick out all the fine absorption lines as colder spots in the spectrum. The beautiful instrument known as the bolometer has recently been used by Professor Langley in feeling for these absorption lines, which, being regions from which the rays are stopped out, are, of course, colder than the remainder of the spectrum. The bolometer, like all the finest applications of science, is an extremely simple thing. It is a strip of fine wire, through which a feeble current of electricity is always flowing. This wire is slowly passed along the invisible gamut of the spectrum, and as soon as it comes to one of the absorption lines the spot is shown by a minute fall of temperature in the wire. This has an instantaneous effect on the flow of the electrical current. More current will pass through a cool wire than a warmer one, and the alteration is promptly shown by a delicate mirror galvanometer, which flashes its mimic signals onto a slowly revolving photographic ribbon. In this way Professor Langley has been able to pick out and locate hundreds of dark absorption lines in the great invisible spectrum which lies beyond the red. Not only is the absorption of rays by the solar atmosphere shown by this method, but the absorption lines of the earth's atmosphere are equally apparent. Dr. Huggins anticipates that the meteorologist will soon be applying the system to weather forecasts."

NEARLY all the glass eyes used in the world are made in Thuringia, Germany.



OPENING OF A POLE RAILWAY IN NOVA SCOTIA.

© 1895 SCIENTIFIC AMERICAN, INC.

The Rewards of Philosophy.

Herbert Spencer's first important work, "Social Statics," was published in 1850, when he was just thirty. The great work of his life—the "System of Synthetic Philosophy"—was taken up in earnest ten years later.

The sacrifices involved in the preparation and production of the gigantic work thus heralded to the world were little short of heroic. Those who know Mr. Spencer by his books alone may have thought of him merely as devoting himself to philosophy out of the abundance of his material wealth and comfort. The truth is far otherwise. No man ever lived a more ascetic life or denied himself more for the sake of the task he had undertaken for humanity. In his evidence given before the Commission on Copyright he tells us in plain words, though in the most severely impersonal and abstract manner, the story of his hard and noble fight during the unrecognized days of his early manhood. Not a fight for bread, not a fight for fame, remember, but a fight for truth. For his first book, "Social Statics," in 1850, he could not find a publisher willing to take any risk; so he was obliged to print it at his own cost and sell it on commission. The edition consisted of only seven hundred and fifty copies; and it took no less than fourteen years to sell. Such are the rewards of serious thought in our generation! Five years later he printed the original form of the "Principles of Psychology." Again no publisher would undertake the risk, and he published on commission. Once more 750 copies were printed and the sale was very slow. "I gave away a considerable number," says Mr. Spencer pathetically, "and the remainder sold in twelve and a half years." During all that time, we may conclude from the sequel, he not only made nothing out of those two important and valuable books, but was actually kept out of pocket for his capital sunk in them.

"Before the initial volume, 'First Principles,' was finished," he observes, "I found myself still losing. During the issue of the second volume, the 'Principles of Biology,' I was still losing. In the middle of the third volume I was losing so much that I found I was frittering away all I possessed. I went back upon my accounts, and discovered that in the course of fifteen years I had lost nearly £1,200—adding interest, more than £1,200. As I was evidently going on ruining myself, I issued to the subscribers a notice of cessation."

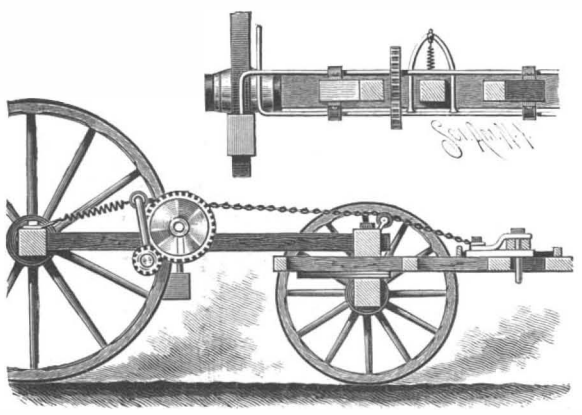
He had been living, meanwhile, in "the most economical way possible;" in spite of which he found he had trenched to that large extent on his very small capital. Spartan fare had not sufficed to make his experiment successful. Nevertheless, he continued to publish, as he himself bravely phrases it, "I may say by accident." Twice before in the course of those fifteen weary years he had been able to persevere, in spite of losses, by bequests of money. On this third occasion, just as he was on the very point of discontinuing the production of his great work, property which he inherited came to him in the nick of time to prevent such a catastrophe. Any other man in the world would have invested his money and fought shy in future of the siren of philosophy. Not so Mr. Spencer. To him life is thought. He went courageously on with his forlorn hope in publishing, and it is some consolation to know that he was repaid in the end, though late and ill, for his single-minded devotion. In twenty-four years after he had begun to publish he had retrieved his position, and was abreast of his losses. Think of that, you men of business. Twenty-four years of hard mental work for no pay at all, and at the end of it to find yourself just where you started! Since that time, it is true, Mr. Spencer's works have brought him in, by degrees, a satisfactory revenue; but consider the pluck and determination of the man who could fight so long, in spite of poverty, against such terrible experiences.—Review of Reviews.

No Water Vapor in Mars.

As the result of observations made at the observatory on Mount Hamilton, W. W. Campbell came to the conclusion last year that no aqueous vapor is contained in the atmosphere of Mars. This, says Knowledge, is quite a different opinion from that to which Janssen was led by his observations, published in 1867, which have been recently republished in the Comptes Rendus. In 1862, Janssen discovered the spectroscopic bands caused by aqueous vapor in our earth's atmosphere, these having been previously observed by Brewster in 1833. From the 12th to the 15th of May, 1867, after having first of all made himself familiar with the bands due to aqueous vapor, he made observations on the summit of Etna. On the 13th the cold was excessive, and the quantity of vapor in the earth's atmosphere was very small—not enough to make visible the lines in the solar spectrum called group C, and still less group D. When Mars was examined, groups C and D, although feeble, were distinctly visible. It was in consequence of this observation, confirmed later at Palermo and Marseilles, that Janssen announced the presence of the vapor of water in the atmosphere of Mars.

AN AUTOMATIC VEHICLE BRAKE.

The brake shown in the illustration applied to the running gear of a wagon is automatically removed from the wheels when the vehicle is moving foward, the brake being applied when the vehicle is backed or is standing at rest. The improvement has been patented by Henry N. Davis, of Dow City, Iowa. The shaft carrying the brake shoes is journaled in bearings on the rear hounds, shown in transverse section in the small figure, and centrally on the shaft is a gear wheel meshing with a pinion journaled in bearings on the under face of the hounds, the latter shaft having a handle for use when desired, and having also a central arched portion connected by a spring with the rear axle. The tension of the spring normally turns the



DAVIS' VEHICLE BRAKE.

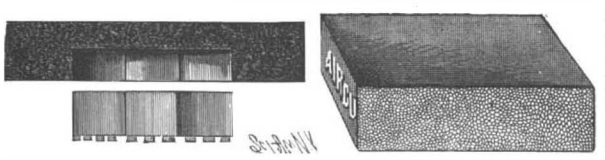
shaft to cause the pinion to act on the gear on the brake shaft to apply the brakes, which are taken off when the vehicle is started by the counteracting tension of a chain carried forward over suitable guideways to attachment to a clevis pivotally connected with the doubletree, the bracket or clevis being secured to a block sliding in the tongue of the vehicle or on the forward end of the reach. When the horses draw forward, causing a limited forward movement of the chain, the pinion and gear are rotated to remove the brake shoes from the wheels.

Suicidal Wasps.

M. Henry, a Frenchman, being curious to see the effect of benzine on a wasp, put some of it under a glass in which a wasp was imprisoned. The wasp immediately showed signs of great annoyance and anger, darting at a piece of paper which had introduced the benzine into his cell. By and by he seems to have given up the unequal contest in despair, for he lay down on his back, and bending up his abdomen, planted his sting thrice into his body, and then died. M. Henry allowed his scientific interest to overcome his humanity so far as to repeat the experiment with three wasps, only to find that the other two did likewise. He is, therefore, of opinion that wasps, under desperate circumstances, commit suicide.

"AIR CUSHION" RUBBER PRINTING STAMPS.

The very low cost of rubber stamps, and their great convenience, have made them, of late years, almost as common about a business office as pens, ink and paper. The illustrations herewith represent an improvement lately introduced whereby the rubber stamp is made more valuable by being better adapted to print plainly on uneven surfaces. It is a patented device of the R. H. Smith Manufacturing Company, of Springfield, Mass., rubber type founders and stamp manufacturers, and consists of the interposition of an air cushion, as shown in the illustration, the cushion being just elastic enough to insure, with ordinary usage, a good impression on any surface, either uneven or yielding. The cushions will not lose shape or resiliency, as they are formed by minute cells which do not



connect with one another, and the cushion is mounted on handsomely nickeled metal plates. There are no pores to fill up with ink and dirt, or compartments to puncture.

Remedy for Insect Stings.

It is well known that liquid ammonia relieves the effects of the stings of bees. A correspondent informs us that a much more effectual antidote is the mixture known as ammoniated tincture of quinine. On several occasions, when stung by bees, he found that the quinine mixture would give much quicker and greater relief than ammonia alone.

Dentistry in Japan.

In a recent letter from Japan to the New York Herald, Colonel Cockerill has this to say about the profession of dentistry in Japan:

A practicing dentist in New York City writes me to inquire whether it be true that the Japanese government is about to establish a school of practical dentistry, and is in need of American talent in the professorships. Not at all. Japan is full of dentistry, and the native dentists are flourishing. There is a dental department connected with the medical branch of the Tokyo Imperial University. There are fifty-six practicing dentists in Tokyo, and each office has from four to twelve students. These young men assist at all operations. One works the drill, another handles the syringe, another passes up the gold foil, and the division of labor is quite scientific. Many of the Japanese dentists are graduates of first-class American colleges. They are quite skillful. The Japanese are quite fond of having their front teeth filled with gold. They frequently have holes bored in good teeth in order to have them plugged and polished. They think that the exhibit of gold fillings in front teeth suggests advanced civilization. San Francisco turns out about one hundred young Japanese dentists a year (?) There is a factory in Tokyo which turns out all manner of dental instruments and dental goods, including engines and porcelain teeth. There are four American dentists in Japan, but their business has been much shorn by the rapidly multiplying native artists.

Asafetida.

This is a bad-smelling substance, oozing as a milky, opaque, fetid juice from the root of Ferula fetida. From the root stock, which in full-grown plants is sometimes six inches in diameter and more than a foot long, somewhat resembling a beet, grow numerous spreading triparted leaves of a leathery appearance and light green color. Out of their midst rises a stem of a luxuriant, herbaceous nature, sometimes as high as ten feet, carrying at the top a numerously branched compound umbel of yellow flowers, which betrays the natural order of the plant—Umbelliferae. Although the odor is so offensive to us, we are told that the people of Bokhara use the small plant as a green vegetable as we do lettuce, and relish it. The root stock, which always protrudes several inches out of the ground, is freed from small rootlets and leaves in the month of June, selecting the plants that have not yet borne flowers, and a slice of it is cut off. The wound is then covered loosely with twigs and leaves, to exclude the sunlight, which retards the process; and it is left this way for a few weeks, at which time a thick reddish or brownish gummy substance is found on the exposed part. This exudation, a hardened suppuration of a vegetable wound, is removed, put into leather bags and taken to Herat, the commercial center of Afghanistan. It is stated, on good authority, that hardly any asafetida leaves that city in a pure state, a red clay being used as an adulterant, which the pharmacists of Europe and America have to filter out when making the tincture. From Herat the asafetida goes to India, and is thence brought by the Parsee and British traders into the markets of the world.

The rose of Kashmir grows in the same ground with the Ferula fetida; they drink the same dew, feed on the same soil, and the same golden sun ripens their fruits. But while the one fills the air with fragrance and enchants the eye, the other, like an evil spirit, destroys our rapture, and calls a chilly halt to our enchantment. Thus the good and the bad live close together, not only among the plants, but also among men; and this close proximity of contrasts directs the differing thoughts of the thinker.—Merck's Report.

A Word to Mail Subscribers.

At the end of every year a great many subscriptions to the various SCIENTIFIC AMERICAN publications expire.

The bills for 1896 for the SCIENTIFIC AMERICAN, the SCIENTIFIC AMERICAN SUPPLEMENT, and the ARCHITECT'S AND BUILDER'S EDITION of the SCIENTIFIC AMERICAN are now being mailed to those whose subscriptions come to an end with the year. Responding promptly to the invitation to renew saves removing the name from our subscription books, and secures without interruption the reception of the paper by the subscriber.

PRICES.

The Scientific American (weekly), one year	$3.00
Supplement of the Scientific American (weekly), one year	5.00
Architect's and Builder's Edition of the Scientific American (monthly), one year	2.50
Export Edition of the Scientific American (monthly, in Spanish and English), one year	3.00

COMBINED RATES.

The Scientific American and Supplement	$7.00
The Scientific American and Architect's and Builder's Edition	5.00
The Scientific American, Scientific American Supplement, and Architect's and Builder's Edition	9,00

This includes postage, which we pay. Remit by postal or express money order or check to order of Munn & Company, 361 Broadway, New York.

© 1895 SCIENTIFIC AMERICAN, INC.

THE IRON INDUSTRIES OF BIRMINGHAM, ALA.

In a recent issue we published an article on the Iron Industry of Birmingham, Ala., in which brief mention was made of the uses to which the products of the iron furnaces of that district were applied. In continuation of the subject, we note the advancement in manufactures made at that place in the last few years.

It is now about twenty years since the then little village of Birmingham became known as the possessor of great wealth in iron and coal. The mineral and metallic deposits were found to lie in such profusion within her district, and in such close proximity, that but little expense need be incurred in their transportation to the furnace for reduction.

At some remote period there was evidently an upheaval of the earth where now stands the city of Birmingham, with a fracturing of the various strata of the earth's crust. This upheaval and the subsequent deposit of soil formed the beautiful valley with the elevated ridges on either side running in a northeast and southwest direction. By this grand process of nature the formerly deeply buried strata of bituminous coal and red iron ore were rendered accessible. For years the ridge upon the south side of this valley has been known as "Red Mountain," without any thought of great value being attached to it. At the close of the war, in 1865, every gift of nature was examined and utilized, and enterprising men, seeing evidences of such wealth cropping out of the earth, took advantage of the opportunity, and, by experiments, ascertained the richness of the ore. Further development showed the mine to be practically inexhaustible, and accompanied with overlying beds of coal.

In our illustrations we show the works in which this ore is made into fine merchantable pig iron. The iron of the Birmingham district is unexcelled for the manufacture of puddled bar iron and for purposes where it is essential that its working qualities in the finished castings should be characterized by that peculiar softness in turning, boring, filing and drilling that is so pleasing to the artisan and satisfactory in the final product. The demands of those who work in iron are varied; that which is most satisfactory to certain manufacturers will not do for a different class. Soft iron is useful for many purposes, but there are many important and extensive fields in which the soft iron of the South has found no place; notably in the use of iron for the manufacture of Bessemer steel and malleable iron. Peculiar qualities are required in these two very important fields of iron consumption, and it has been questioned if the Birmingham iron could come into use for these purposes.

The only use of pig iron prior to the invention of Bessemer, aside from that of making castings, was for the manufacture of wrought iron, for which purpose the softer grades of pig iron were specially adapted, also for other purposes in which the presence of such disturbing elements as sulphur, silicon, and phosphorus did not prove injurious. The process discovered by Bessemer of converting pig iron directly into steel was found to depend for success upon the almost entire absence of these disturbing elements; the value of an iron, for the Bessemer process, is carefully determined by chemists. The presence of 0·1 per cent of phosphorus, or 2 per cent of silicon, unfits it for making Bessemer steel, although it would still be serviceable for puddling into wrought iron and converting into blistered steel.

Until recently the irons made from the red ores of Birmingham contained phosphorus and silicon in quantity sufficient to prevent their use in the Bessemer process, as analysis showed the presence of 0·8 per cent of phosphorus. The subject of elimination of phosphorus from iron had been the study of chemists until 1878, when it was found that phosphorus would unite with lime and float as a slag consisting of phosphate of lime. By virtue of this important discovery it has been possible to convert millions of tons of iron into steel, this being known as the "basic" process, a process in which the converter is lined with magnesite bricks, with quantities of free lime, oxygen being provided by the introduction of scrap iron or ground limonite (brown ore). This process is used in the "open hearth" system, perfected by Gilchrist and Thomas.

The Birmingham irons, however, were unfitted for this purpose, as the amount of phosphorus was so great as to necessitate such an amount of lime to take up the phosphorus as to be destructive to the acid lining of the converter, and the amount of silicon was too great to admit of treatment in either a basic Bessemer converter or an open hearth furnace.

It has, therefore, been found that the Southern irons produced in the old way were unfitted for Bessemer or open hearth processes.

What has proved a failure, however, with chemistry as the teacher has been learned—so we are credibly informed—by the union of chemistry with skillful and correct management of the heats and of the burdening of the ore over the coke.

The "Alice" furnace of the Tennessee Coal and Iron Company, in Birmingham, an interior view of which we show on our front page, has, by careful management, been successful in producing pig iron from the ores of the Birmingham district, showing a percentage of considerably less than 0·1 per cent of phosphorus and 0·5 per cent of silicon. Tests of the iron have so far satisfied the chemists of such well-known steel producers as the Carnegies, Jones & Laughlin, Park Brothers, and others that already—as we are informed—thousands of tons of this pig iron have been ordered by them from Birmingham furnaces. The importance of these results will be appreciated when the cheapness with which Southern iron can be produced is considered.

Our illustrations show the casting flow of the "Alice" furnace, and a perspective and sectional view of one of the moulds. It will be seen that the pigs are cast in iron moulds instead of sand moulds as usual. One of the main objects in this method is to prevent the crusting of the exterior surface of the pig with extra silica, which would deteriorate the iron in subsequent melting.

A Submerged Forest.

Many years ago, even so far back that the traditions of the oldest Siwash extend not thereto, there was some vast upheaval of Mother Earth on the shores of Lake Samamish that sent a portion of the Newcastle hills sliding down into the lake, with its tall evergreen forest intact, and there it is to this day. About this time of the year the waters of the lake are at their lowest, and then the tops of the tallest of these big submerged trees are out of the water, but never more than ten or twelve inches.

Unfortunately for the curiosity seeker and traveling public generally the submerged forest is on the opposite side of the lake from the railroad and the station of Monohon, and very few people ever see the phenomenon unless they take the time and pains necessary to reach it.

Sam Coombs, the pioneer, is very enthusiastic concerning its beauties and mystery. He talks Chinook fluently, but with all his quizzing of the red-skinned inhabitants he has never learned anything that will throw any light on the history of the forest under water. The waters of the lake are very deep, and the bluffs back of the beach very precipitous, so that the only explanation of the freak is that either by an earthquake or some other means a great slide has been started in early times, and it went down as a mass until it found lodgment at the bottom of the lake. At this time one can see down into the glassy, mirror-like depths of the lake for thirty feet or more. Near the banks the forest trees are interlaced at various angles and in confusion, but further out in the deep water they stand straight, erect, and limbless and barkless, 100 feet tall. They are not petrified in the sense of being turned to stone, but they are preserved and appear to have stood there for ages. They are three feet through, some of them, and so firm in texture as to be scarcely affected by a knife blade. The great slide extended for some distance, and it would now be a dangerous piece of work for a steamer to attempt passage over the tops of those tall trees. Even now the water along shore is very deep, and a ten foot pole would sink perpendicularly out of sight ten feet from the shore line.

All over this country are found strata of blue clay, which in the winter season are very treacherous, and given the least bit of opportunity will slide away, carrying everything above with them. This is the theory of the submerged forest of Lake Samamish. It probably was growing above one of these blue earth strata, and heavy rains, or probably an earthquake, set it moving. The quantity of earth carried down was so great that the positions of the trees on the portion carried away were little affected. It is hardly to be believed that the earth suddenly sank down at this point and became a portion of the beautiful lake.

Few such places exist. There is a place in the famous Tumwater Canon, near Leavenworth, which is in some respects similar. At some early time a portion of the great mountain side came rushing down and buried itself at the bottom of the canon. Now there is a considerable lake, and in the center stand tall, limbless trees, different in species from those growing along the canon.

At Green Lake, near Georgetown, Col.—a lake which is 10,000 feet above sea level—is a submerged forest of pine trees, some hundred feet tall, but not so numerous as in Lake Samamish. This same theory explains their presence as given above.—Seattle Times.

The Discovery of Argon.

Lord Rayleigh and Prof. Wm. Ramsay called at the United States Embassy, in London, recently, when Mr. James R. Roosevelt, first secretary, handed to them a check for $10,000, which had been granted by the Smithsonian Institution, at Washington, as the first Hodgkins prize, for their memorandum on "Argon, a new constituency of the atmosphere," embodying a most important discovery in connection with atmospheric air.

Correspondence.

Sylvanus Sawyer.

To the Editor of the SCIENTIFIC AMERICAN:

My attention has been called to an article in a recent number of the SCIENTIFIC AMERICAN concerning the late Sylvanus Sawyer.

No mention is made of his connection with his brothers Joseph and Addison.

While I would not detract from his prominence as an inventor, no account can properly be given of him that does not include them, one or both of whom were always associated with him in business in the old "gun" days, and were also inventors in those lines. Addison invented a combination shell used in the late war, a combination fuse, and other ordnance articles, upon which he obtained patents.

He also invented the "Sawyer canister," which was adopted by the government, and for which he was awarded $25,000.

Concerning the rattan business, Addison's invention, the "tubular spurred cutter" for utilizing rattan pith, patented by him in 1854, revolutionized the rattan industry of the world.

They were three remarkable men, sprung from a race of ingenious mechanics.

Granting the honor due his brothers will not lower the rank of Sylvanus Sawyer among the inventors of his time.

Allow me to make a correction. Sylvanus Sawyer died at his home in Fitchburg, Mass., not "Templeton," where he had long been identified; also that he was the son of John and Lucy (Balcom) Sawyer, instead of "Malcom J." MARY E. SAWYER.

Boston, Mass., November 25, 1895.

Electric Power in New York City.

The Electrical Engineer says that on January 1, 1895, the Edison Electric Illuminating Company had connected 7,615 horse power of electric motors, but at the end of October it had no less than 11,263 horse power, an increase of 3,648 horse power in the short period of ten months. The horse power capacity thus connected includes, it would seem, a great many of the fan motors, but not all, as it is becoming a common practice for people to plug the small motors into lamp sockets without fuss or notice, and, of course, these do not appear on the returns.

The company has 251,487 incandescent lamps connected and 3,280 arcs. This would figure out in the neighborhood of 25,000 horse power, so that one-third of the company's total connected capacity is now represented by motors. This is a notable showing for power uses of current. We estimated that whereas in the census year, 1890, the motors averaged about 1 horse power each, they might now reach 5 horse power. Mr. Lieb informs us that the motors average between 5 and 10 horse power, and that one of the motors in regular service on the mains has a rated capacity of 40 horse power. It is evident that the stationary motor industry must be increasing at a rapid rate, for these figures, large as they are, take no account of other stations than the Edison, and do not include isolated plants, many of which are heavily loaded with motor duty in running pumps, elevators, ventilators, etc.

The Preparation of Wool for Underclothing.

The method of preparation consists in soaking the pure, unsulphured, undyed wool in the extract described below.

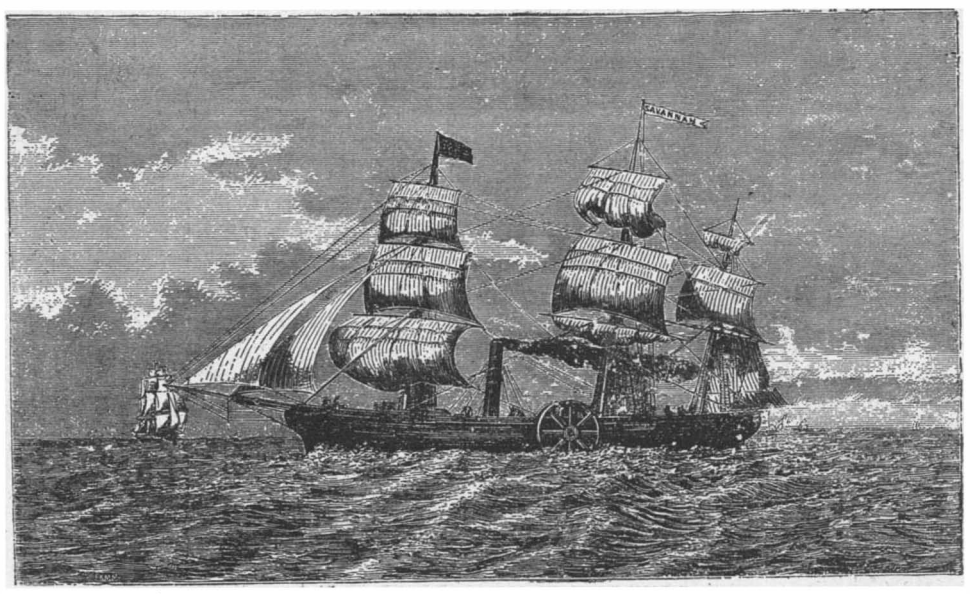
Bark, taken from the stem and roots of the Daphne mezereum, a tree growing in the northern regions of Europe, after being dried in the air for rather less than a year, is cut up finely and placed in 40 per cent of spirits of wine and 60 per cent of water, for six days, in the proportion of one part of bark to four parts of the mixture. In this time, the spirits of wine draws out of the bark resin, oil, daphnine, wax, etc., and a brownish mass results. After straining it off from the macerated bark, the extract is put into a copper vessel of such a shape and size as is suitable and convenient, then heated to 35° Reaumur, and the wool in a completely loose condition, so that the extract may reach and act on all the fibers, is placed therein, and kept for three hours at this temperature, whereby it is impregnated with the alcoholized extract. After this time, the wool is taken out of the vessel and dried on wide meshed hurdles; it can then be spun and woven.

The patentee claims that, during wear, the wool prepared by this method remains generally odorless and possesses an unsurpassable suppleness and softness, as well as a peculiar absorptive activity on the humors and perspiration of the body, which are therefore drawn to the outside of the texture, causing the body to keep dry; that the wool loses its natural harshness and the prepared material does not irritate the body, and that the single fibers become exceedingly elastic, porous, more capable of absorption and shrink no more, so that the properties beneficial to the human body are never lost, even by washing, cleaning and thorough airing of the stuff.

© 1895 SCIENTIFIC AMERICAN, INC.

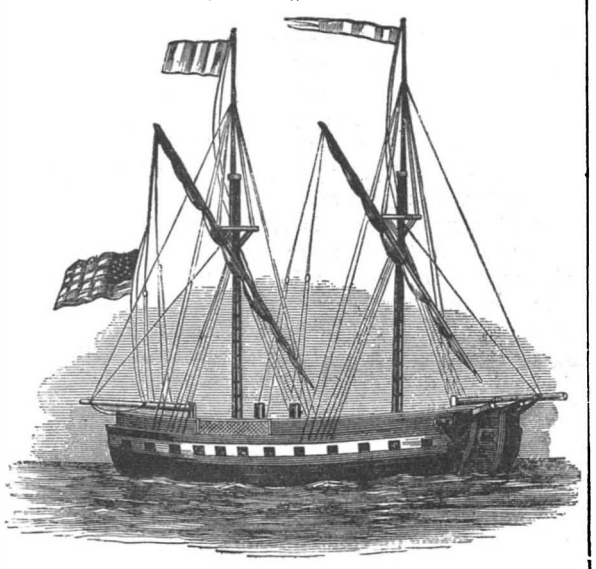
THE EARLY HISTORY OF OCEAN STEAM NAVIGATION.

Although the paddle wheel antedates the Christian era, the earliest recorded attempt to utilize steam to turn the paddle wheel was made by Blasco de Garay, in 1543. Denis Papin experimented on the Fulda at Cassel in 1707, and various other experiments were tried by Jonathan Hulls, the Count d'Auxiron and the Marquis de Jouffroy, but these experiments were of little importance when compared with those of the Americans, William Henry, of Chester County, Pa., James Rumsey, John Fitch and Robert Fulton. After studying the subject of steam navigation abroad, Fulton returned to the United States in 1806, and with Chancellor R. Livingston had a boat named the Clermont built at New York by Charles Brown. The hull was of wood and was 133 feet long, the breadth of beam was 18 feet, and depth of the hold was 7 feet, and the vessel was of 160 tons burden. The engines were built in England by Boulton & Watt; the diameter of the cylinder was 24 inches, and the piston had a 4 foot stroke. The boiler, which was made of copper, was 20 feet long, 8 feet wide and 7 feet high, and was only adapted for low pressures. The engine drove paddle wheels situated amidships; these wheels were 15 feet in diameter, and there were 8 buckets to each wheel, 4 feet long, and the dip was 2 feet.



THE SAVANNAH.

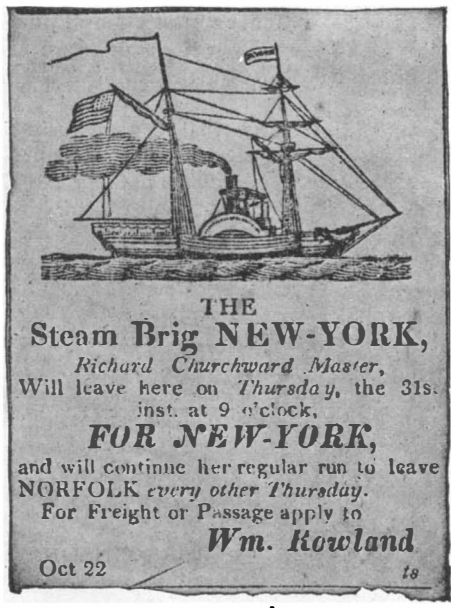
The Clermont may be regarded as the world's first successful steamboat. The first trip was made on August 7, 1807, from New York to Albany. Her speed nearly averaged 5 miles per hour. The next year the Clermont was enlarged, and the name of the vessel was changed to the North River.



THE WAR STEAMER FULTON THE FIRST.

The first sea voyage ever made by a steam vessel was made by the Phœnix, a side wheel steamer with engines designed by Colonel John Stevens, built in 1807. The steamer could not ply on the Hudson, as Fulton and Livingston held the monopoly of the navigation of that river. The Phœnix was taken by sea around to the Delaware River. This was the first sea voyage of a steamer, and after this time the evolution of the steamboat was rapid.

The first war steamer was built at New York by Robert Fulton. During the war of 1812, when our navy was making a glorious record at sea, the subject of the defense of cities and harbors was agitated, and Fulton was called upon to design a steamship of war, which was called the Demologos, or Fulton the First. The hull, which was of wood, was constructed by Adam and Noah Brown in the Eastern District of Brooklyn. She was launched on October 29, 1814. As launched she was considerably modified from the original plans. She was 156 feet long, 20 feet deep and 56 feet broad. Instead of a small well for the paddle wheel, a long channel, 13 feet wide and 66 feet long, was provided for it. On one side of the hull was a copper boiler, 22 feet long, 8 feet deep and 12 feet wide. On the other side was the engine, with one cylinder, 48 inches in diameter and 5 feet stroke. The paddle wheel was 16 feet in diameter and 14 feet wide, giving a clearance of 6 inches from the sides of the channel. It dipped 4 feet. Her tonnage was computed at 2,475 tons—a very large vessel for that period. Her hull was designed by Samuel Humphreys, of New York, and cost $144,949. The boilers and engines were designed by C. W. Copeland. The engine cost $40,199 and the boiler $93,396. Great difficulty was experienced by the commissioners in getting men to work on her. It was war times. Many of the New York shipbuilders were gone up the lakes. Material was very difficult to supply; guns were transported by land from Philadelphia, over the "miry roads of New Jersey," as the commissioners described them. Twenty heavy cannon were thus brought to New York. As completed she was to carry thirty long 32-pounders and two Columbiad 100-pounders. In June, 1815, her engine was in a condition to be tried and on July 1 she went down New York Bay to the Narrows on her first trial trip, and on July 4 of the same year she made a 53 mile passage out on the ocean and back in 8 hours and 20 minutes. The war terminating, she was moored on the flats abreast of the navy yard in Brooklyn, where she was used as a receiving ship. On June 4, 1829, she blew up, killing and wounding a number of people.

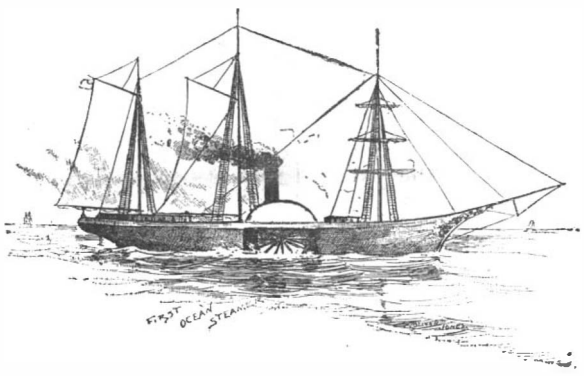

THE
Steam Brig NEW-YORK,
Richard Churchward Master,
Will leave here on Thursday, the 31st. inst. at 9 o'clock,
FOR NEW-YORK,
and will continue her regular run to leave NORFOLK every other Thursday.
For Freight or Passage apply to
Wm. Rowland
Oct 22
ts

A SHIPPING ADVERTISEMENT OF 1822.

To America belongs the glory of building the pioneer transatlantic steamship. This was the steamer Savannah, which was built at Corlaers Hook on the East River, New York City. She was launched August 22, 1818.

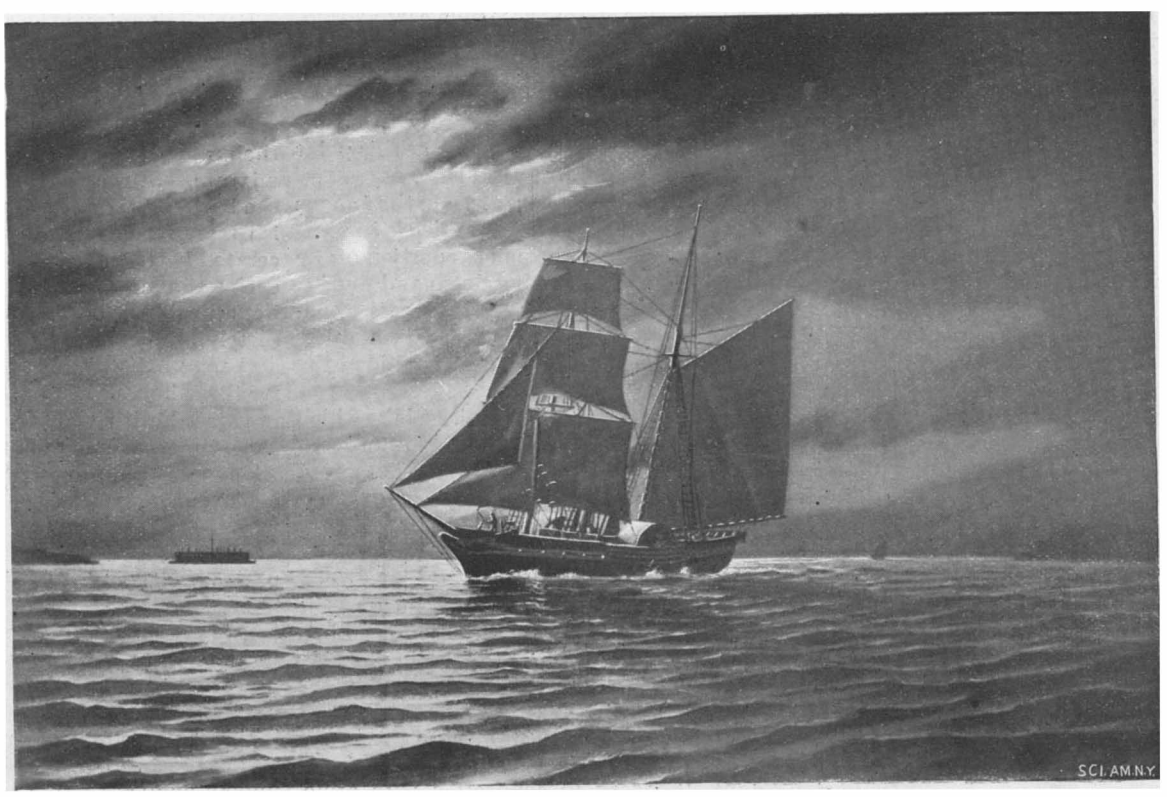
She was built by Francis Tickett for Daniel Dodd. Her engines were made in America. She was intended to be used as a sailing packet between New York and Liverpool, but was purchased before being finished by William Scarborough & Company, of Savannah, Ga., and fitted with machinery.

It is a curious fact that the paddles were so constructed as to be folded up and placed on deck in stormy weather; the wheel was inclosed in canvas supported by an iron frame. She could carry only seventy-five tons of coal and twenty-five cords of wood. Commanded by Captain Moses Rogers and navigated by Stephen Rogers, both natives of New London, Conn., the Savannah sailed from Savannah, Georgia, on the 25th day of May, 1819, bound for St. Petersburg, via Liverpool. She reached the latter port on January 25, having used steam eighteen days out of twenty-six, and thus demonstrated the feasibility of transatlantic steam navigation. The machinery was afterward taken out of the Savannah and she was turned into a sailing packet. For some time she ran between New York and Savannah and was finally wrecked on the Long Island coast. For interesting details of the first transatlantic trip from the log book see the SCIENTIFIC AMERICAN SUPPLEMENT, No. 636.



THE ROYAL WILLIAM.

The second ocean steam vessel was the steam brig New York, built at the foot of Newcastle Street, Norfolk, Va., in 1821, by William F. Hunter, ship joiner. She was of 281 tons burden and 50 horse power. Her owners were George Rowland (father of Mr. Thomas B. Rowland, through whose courtesy we are indebted for the advertisement from the Norfolk Beacon of October 28, 1822, which we reproduce), Charles N. S. Rowland, John Allmand, Captain Richard Churchward, and William F. Hunter. The motion of the machinery was steadied by a large flywheel. The trip from Norfolk to New York was made in fifty hours.



THE STEAM BRIG NEW YORK.

The engraving of the steam brig New York was made from a photograph taken from the original oil painting, which is the property of the Old Dominion Steamship Company, and is now deposited in Sailors' Snug Harbor, at Staten Island. The sailmakers' boy who helped rig the New York is still living in Norfolk, at the age of ninety-five, and states that the rough cut in the old advertisement was made by local artists

© 1895 SCIENTIFIC AMERICAN, INC.

direct from the ship. Next to the Savannah and the New York comes the Royal William, which it is said was the first sea-going steamer that ever crossed the ocean, propelled all the way by steam. It was built in 1830–1831 at Quebec, Canada, and was of 1,645 tons burden and was intended as a packet ship between Quebec and Halifax. In 1833 she was sent to London. She arrived after a prosperous trip of twenty-five days; she was afterward sold to the Spanish government.

The following were her dimensions: Length of deck, 169 feet; length of keel, 159 feet; extreme breadth, 47 feet; depth of hold, 19 feet; rake of post, 2 feet; rake of stern, 13 feet; draught of water, 14 feet.

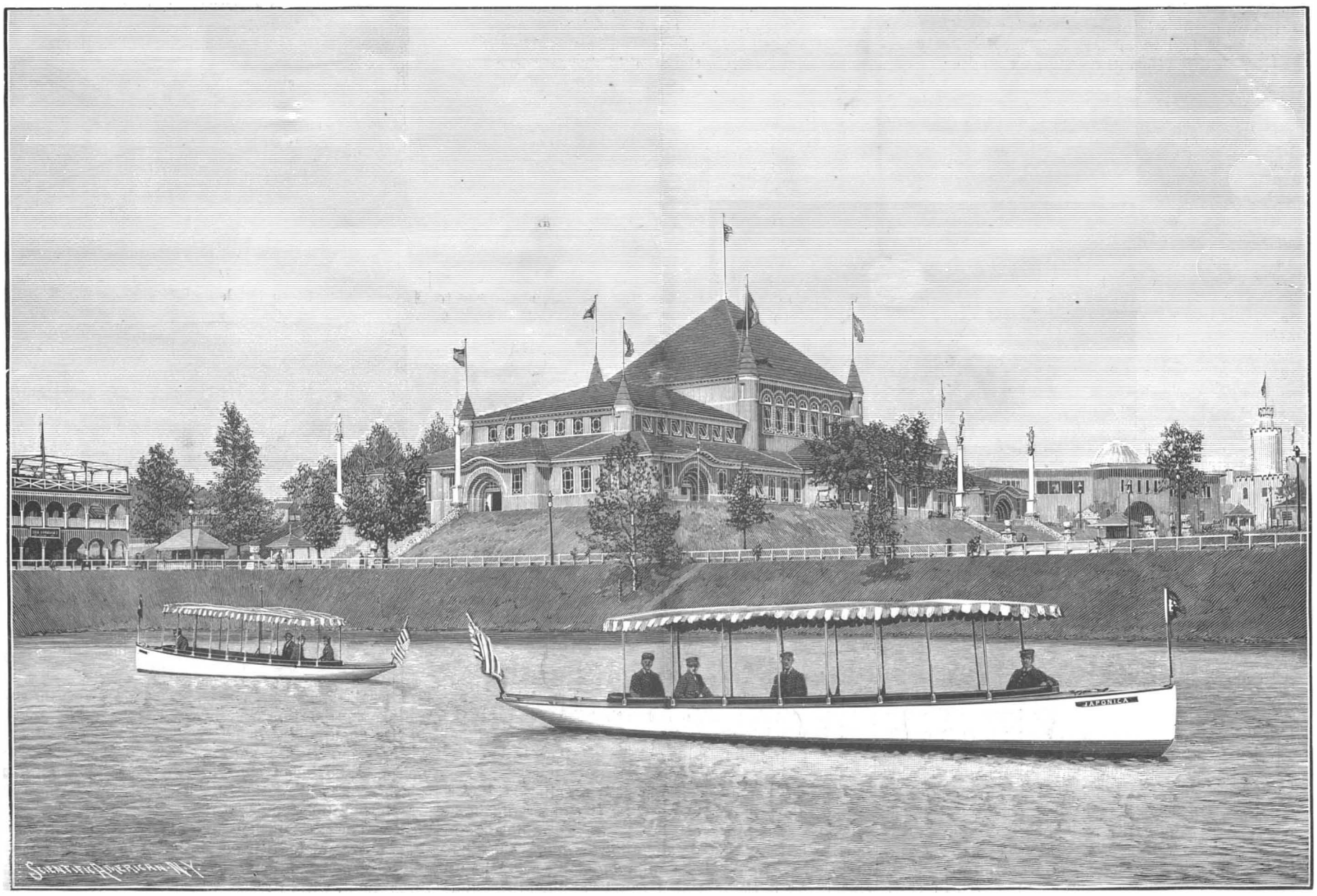
For detailed account of this vessel see SUPPLEMENT, No. 801.

THE ATLANTA EXPOSITION.

In our issue of November 30 we presented an interior view of the Fine Arts building at the Exposition grounds. We show herewith a portion of the exterior, the view being taken from a point to best bring out the details of ornamentation. The edifice, designed as a permanent structure, stands upon the highest part of the grounds between the Government and New York State buildings, and has a frontage of 245 feet, including the two side wings, one of which shows in our view as projecting beyond the main building. The depth of main structure is 100 feet and the height of the center façade is 50 feet. The building is classical in design, with a portico roof supported by a single row of Corinthian columns. A highly ornamented frieze enriches an otherwise plain but beautifully proportioned front, and the broad steps are flanked on either side by life-sized figures of lions in bronze.

We also show in another view the Agricultural building, as seen from the bank across the Clara Meer. This structure is 304 feet long, 150 feet wide, and is 110 feet high. The contributions from the various States of the South, of the soil products of farm and plantation, is of exceeding interest. All of the

THE ATLANTA EXPOSITION—THE FINE ARTS BUILDING.



THE ATLANTA EXPOSITION—THE AGRICULTURAL BUILDING.

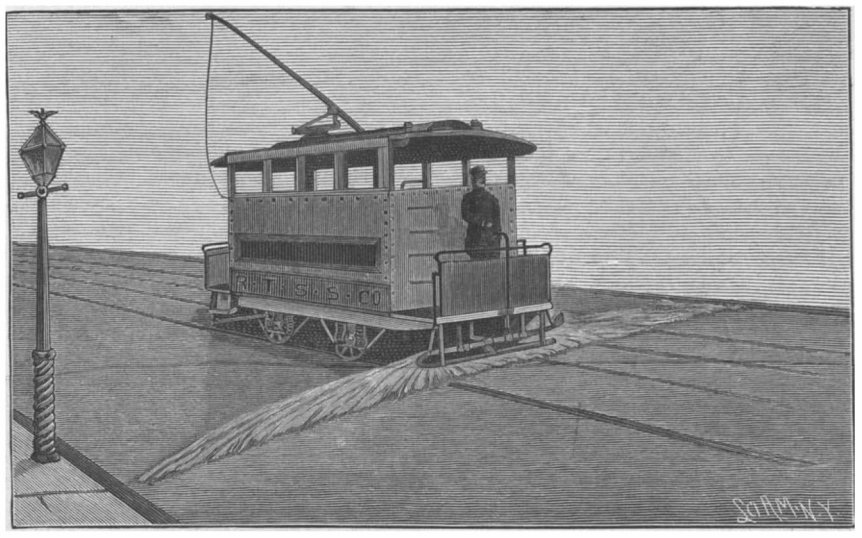
© 1895 SCIENTIFIC AMERICAN, INC.

various grades of cotton are shown, exhibiting their merits for color, fineness, and length of staple. Sugar and molasses in all forms, from the raw cane to the finished sweets. Fruits and grains are shown in great varieties. Specimens of plums and that wonderful Southern grape, the Scuppernong, are especially tempting. It is worthy to note, also, that the exhibit of wines from the Southern grapes denotes a near-by source for this great market that may cause trepidation in the distant Californias.

The arrangement of the exhibits displays artistic as well as convenient location for the visitor. To the Northern man or woman this building and its interior presents great attraction.

THE ELECTRIC RAILWAY STREET SPRINKLER.

Mr. L. W. Campbell is the inventor and patentee of a new design in railway street sprinklers. The accompanying illustration shows its appearance when in use. It is a combined track and street sprinkler, and the first effort within our knowledge to combine the two ideas. It is so constructed that it will, at the pleasure of the motorman, sprinkle a single or double track alone, omitting the sides, or it will sprinkle one or both sides, including the track, if desired. It will sprinkle a street of any reasonable width, say a street so narrow as to barely allow the car to pass, to a street one hundred feet wide, without any change in the structure of the machine. The Car says the Rapid Transit Street Sprinkler Company, of Waco, Tex., are the makers.



THE ELECTRIC RAILWAY STREET SPRINKLER.

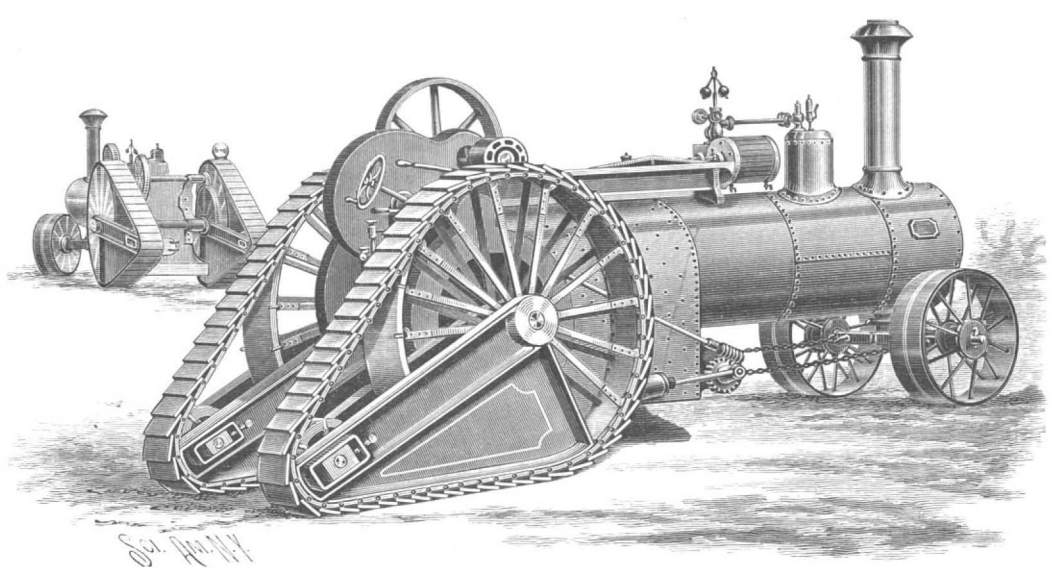
Why Propeller Shafts Break.

It is getting to be pretty well understood that the frequent breaking of propeller shafts is not due to the defective material of the shafts themselves so much as to the excessive strains to which they are subjected, owing to the working and straining of the hull of the ship in a seaway. The Railway Engineering and Mechanic states that careful measurements taken on a steamer in heavy weather showed that the propeller shaft was at times sprung out of line 1¼ inches in a length of 112 feet. Measurements on deck showed the same amount of deflection. The ship was stiffened, and the shafting gave no further trouble.

INGLETON'S IMPROVED TRACTION ENGINE.

Many unsuccessful attempts have been made to design a practical automatic track for use on traction engines, whereby the latter could be made to serve all the requirements of the farmer, but, apart from their being generally too cumbersome, it has frequently been found difficult to turn the engine around or make a curve within a reasonable space.

The illustration represents an improved track-laying device, which has been patented by Edward Ingleton, of the Ingleton Steam Plow Company, of Pottstown, Pa., for use on traction engines. The illustration shows the appliance both in and out of operation. The track is pivoted to the main axle of the engine, and is so fitted that it can rise or fall without altering its length. It is connected by a rod or pitman to a crank keyed on each end of the steerage roller, so that the vertical movements of the track are governed automatically by the steering of the engine and the lateral movement of the front end of the latter. The moment the engine is steered from its straight course the cranks on the steering roller come off the dead center, and allow the back end of the track to rise in the same proportion as the front, or steering axle, has turned. This brings the center of the weight back under the main axle, and the engine can swivel around in as short a space, and without straining the track, as if the track were not there. The appliance is designed to greatly increase the usefulness of the traction engine, from which it can be detached in a few minutes, as desired. The steering and adjusting of the track is done by Ingleton's steam steerage, not shown in the engraving. When not required in use, the cranks on the steering roller are reversed and the track is then held clear of the road.



INGLETON'S IMPROVED TRACTION ENGINE.

The importance of being able to use a steam engine in all the laborious work of the farm, and thereby reduce the number of horses and men required in cultivation, with the attendant cost of feeding through many months when in idleness, cannot be overestimated. If the thousands of horse power available in traction engines that are now idle could be successfully harnessed, it would prove a most powerful auxiliary to the farmer, as such engine, fitted with a proper track, according to the design of the inventor, should be made to plow; then, by means of a suitable machine, to seed and harrow, run the self-binder at harvest, and, lastly, do the thrashing.

Progress of the Panama Canal.

It was announced recently that the French company in charge of the work on the Panama Canal is now collecting 2,000 more men from Jamaica and other West Indian islands to add to the 1,800 now at work, and that it is intended eventually to increase the force to 6,000 men. The New York Evening Post declared that it had received information which it considered trustworthy that the money to finish the work on the present plan has all been furnished, and that nothing can prevent the opening of the canal at the appointed time, except accidents and obstacles not now anticipated. The managers even expect that the work will be completed in six years. This is quite in line with the report made by Sir Henry Tyler, the late president of the Grand Trunk Railway, who has been visiting Panama. He says that it is proposed to construct two large dams, one across the Upper Chagres River and one on the Lower Chagres River. Two lakes will thus be formed, the upper one supplying water to the higher portion of the canal, while the lower one will be mainly used to furnish water for the navigation of the lower part. Ten locks will be built, enabling the canal to reach a height of 170 feet above the sea level. Sir Henry holds that there is no insuperable difficulty in the completion of the canal in six years, at a cost of $100,000,000 by utilizing the work already done for a distance of sixteen miles from Colon and four miles from Panama. On the other hand, Mr. Colquhoun, the correspondent of the London Times, who has recently inspected the route, estimates that, even supposing one-third of the work to have been concluded, it will cost more than $200,000,000 to complete the entire undertaking. He declares that the Chagres River and the Culebra cut of the present Panama Canal plans are insurmountable obstacles.—The Outlook.

PATENTED artificial skin is now produced in Germany. It is made by removing the outer and inner mucous membranes of the intestines of animals and partly digesting them in a pepsin solution. The fibers are then treated with tannin and gallic acid, the result being a tissue which can be applied to wounds like a natural skin, and is entirely absorbed in the process of healing.

An Improved Motor for Sewing Machines.

Sewing machines adapted for useful general work are invariably driven by a treadle to which either one or both of the feet may be applied. The ordinary treadle answers well for the stitching of exceptionally stout materials and for the purposes of various machines driven with the foot by men such as turners or printers, but for average sewing machine work it has the drawback of requiring more effort than is necessary. This extra fatigue is a serious consideration in the case of females employed all day long at the machine, but an ingenious modification of the ordinary treadle has now been introduced by which the labor of the worker will be greatly economized without any sacrifice of efficiency. As is well known, the ordinary treadle is horizontal when at rest and has to be forcibly depressed by the foot in order to turn a flywheel by means of a crank. In the new system the flywheel and crank are retained, but the horizontal treadle is replaced by a vertical one which is hinged to the under side of the table on which the machine rests, and hangs down almost to the floor, where it ends in a horizontal platform for the foot. The worker's foot is not moved up and down to drive the machine by pressing the treadle, but produces the same effect with less labor by a gentle swinging of the foot backward and forward. The muscles chiefly employed are the flexors and extensors of the knee joint, and the weight of the foot and leg is, of course, supported by the platform on which the foot rests. An important advantage is that the continual movement of the thigh, inevitable under the present system, is so diminished as to be hardly perceptible. The "Hygienic Motor" is the appropriate name of the new invention; its principle is sound and the details are extremely simple. The ordinary treadle is employed to most advantage when the flywheel is comparatively heavy and the operative stands at the machine; but for seamstresses who sit all day long at the machine the to-and-fro movement of the foot is less exhausting than the alternate upward and downward movement which has hitherto been required. The new system can be readily adapted to any of the existing kinds of sewing machine.

The Absolute Dimensions of Stellar Systems.

In a recent number of the Astronomische Nachrichten (No. 3314) Dr. T. J. J. See has a very important paper on the "theory of the determination, by means of a single spectroscopic observation, of the absolute dimensions, masses and parallaxes of stellar systems whose orbits are known from micrometrical measurement; with a rigorous method for testing the universality of the law of gravitation." The ordinary determination of the orbit of a double star furnishes us no idea as to its distance from us, and hence no measure of the absolute dimensions or masses of the system. The measures of the parallax upon which we depend for our estimates of distance are extremely difficult and the results are in most cases unsatisfactory. The measures are taken from neighboring faint stars, which are assumed to be so much more distant that their annual displacement will be imperceptible. This assumption is not always safe and the resulting parallaxes can only be regarded as relative.

Dr. See shows how, by a very simple and elegant method, we may determine the absolute dimensions of the orbits of bright rapidly revolving binary stars, by single spectroscopic measures of the motions in the line of sight of the component stars. From the dimensions and other known data of the orbits, the actual masses of the stars and their distances from us can be easily calculated. But the most important result of this method is the means it furnishes of testing the question whether the Newtonian law of gravitation applies to stellar systems as well as to the solar system. Dr. See shows how we may calculate the motion in the line of sight in all parts of the binary orbit. These calculations are based upon the law of gravitation and a single spectroscopic measure. If such measures be continued upon a number of pairs, while the stars complete their revolutions and the computed and observed motions in the line of sight agree throughout, within reasonable limits of error, it will constitute a strong proof of the universality of the Newtonian law.—H. C. W., Popular Astronomy.

© 1895 SCIENTIFIC AMERICAN, INC.

THE ECLIPSE OF THE MOON, SEPTEMBER 3, 1895.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

The accompanying photographs of the lunar eclipse of September 3, 1895, were taken at this observatory with the equatorial telescope of ten inches aperture with photographic corrector. The pictures are direct enlargements in the telescope, the diameter of the image of the moon in the principal focus of the telescope being one inch.

Fig. 1 shows the moon before totality, and Fig. 2 as it is passing out of the shadow after totality.

The night was very clear, and all the phenomena connected with the eclipse were the most beautiful ever witnessed by the writer.

Smith Observatory, Geneva, N. Y., Nov. 20, 1895.

THE TOTAL LUNAR ECLIPSE: ITS ASTRONOMICAL VALUE.

Celestial phenomena have ever excited in the unlettered mind a wondering interest; an interest which in the early ages was seasoned with a large admixture of superstitious dread. Eclipses of the sun and moon, more often than not, were interpreted as prophetic of approaching disaster and brought much unrest to the minds of men.

Science has changed all that; and these periodic phenomena are now eagerly anticipated, and closely observed, for the astronomical data which they afford. Formerly the chief use to which the total lunar eclipse was put by the astronomer was the determination of longitude.

The moment of total eclipse is the same for every station on that half of the globe which faces the moon; and the observation of this time of totality enables us to calculate the difference of longitude between any two points of observation. Such computations however lack exactness, owing to the fact that it is difficult to determine the precise moment of totality. The varying density of the earth's atmosphere causes a varying intensity in the sun's rays that pass through it. There is consequently no sharp, clearly defined edge to the umbra or shadow, and it is difficult to tell exactly when the edge of the moon has passed into it.

The most important observation is that of the occultation of the stars, or their passage behind the moon. At ordinary times the brilliancy of the moon is such that only the brightest stars can be seen as they approach it. During eclipse, and owing to the fact that the moon has no atmosphere, stars of very faint power can be observed up to the moment at which they pass behind the planet. In determining the place of the moon by this method the occultation of certain stars is observed simultaneously at different observatories, widely separated.

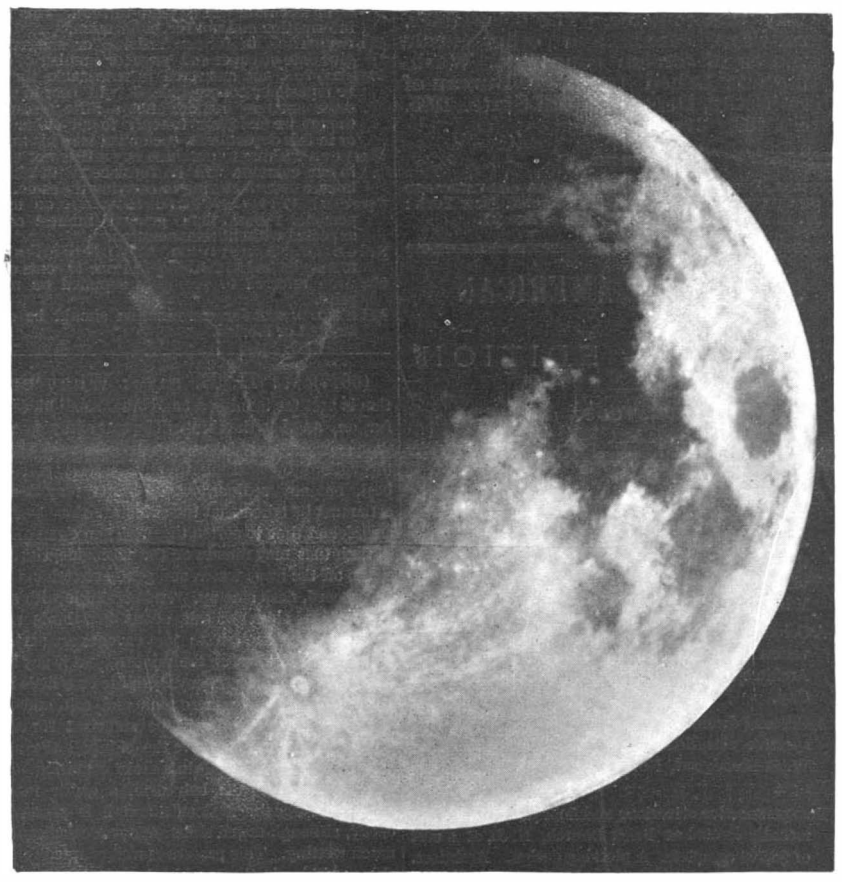
This siderial occultation, which, for the reasons above given, is very exact, is used for calculations of longitude, and to establish the diameter of the moon, its distance from the earth, and its right ascension and declination.

A total eclipse affords a special opportunity of making a spectroscopic examination of the earth's atmosphere. The sun's rays, during eclipse, pass through the atmospheric envelope obliquely on their way to the moon. Their course at this time through the atmosphere is much longer than when they fall normally to the earth, as they do during the day time. After being reflected from the moon they again pass through the earth's atmosphere before they strike the spectroscope. In this way the earth's spectroscopic lines are obtained of greater distinctness than is possible in ordinary observations.

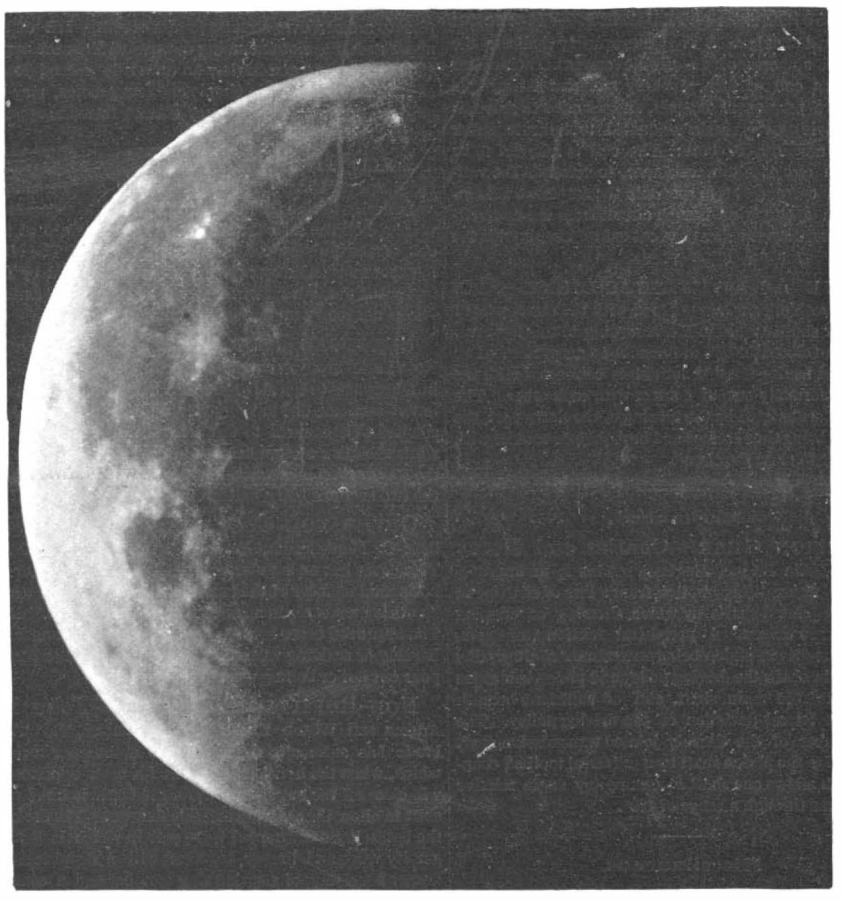
The total eclipse has been used to determine the amount of heat thrown out by the moon. During eclipse, for obvious reasons, the moon cannot give off reflected heat. Any heat that we then receive must be heat that has been absorbed from the sun, and is now being radiated. The observations show that as the light fails so does the heat; which proves that lunar heat is reflected, not radiated.

Many historical dates have been accurately fixed by means of calculations based upon the lunar eclipse. "The first olympiad, the beginning of the Christian era, and the death of Augustus are some of the events whose dates have been settled by the occurrence of lunar eclipses."

The value of the lunar eclipse is discussed in fuller detail in the November issue of Popular Astronomy by Caroline E. Furness, of Vassar College Observatory. The paper closes with an interesting description of the methods of observation adopted by the students of this college during the eclipse of September last.



BEFORE TOTALITY.



AFTER TOTALITY.

ECLIPSE OF THE MOON, SEPTEMBER 3, 1895.—PHOTOGRAPHED BY WILLIAM R. BROOKS.

The Electrolysis of Milk.

In a somewhat lengthy paper by Mr. C. E. S. Phillips, the author, after referring to some of the tests adopted for ascertaining the purity of milk, proceeds to describe experiments undertaken to discover whether electrolysis would offer a more expeditious and reliable method than those in use. On electrolyzing a sample of milk between platinum electrodes, the anode became coated with a white, spongy-looking material which increased until so thick upon the plate that it ultimately became disengaged and floated to the surface of the milk; it was observed on making experiments in this way that the white deposit consisted principally of a mixture of caseine and fat, that the milk gave off a characteristic odor during the electrolysis, and it was found to be slightly alkaline after the operation.

The liberated caseine floating upon the milk seemed to show that, owing to alkalinity of the solution, it had become insoluble; it was, however, evidently due to the lifting power of the gas bubbles clinging to it. By continuing the electrolysis further it was possible to extract practically all the solids from the milk used (30 cub. cm.), leaving a transparent solution behind; at the same time no appreciable deposit of any kind took place at the negative electrode. Tests made with litmus paper during electrolysis showed that the action was extremely local; it was, however, noticed that the froth on the negative electrode produced by a too rapid electrolysis was strongly alkaline

The formation of caseine on the positive electrode was then studied in a miniature cell under the microscope. On making the circuit, bubbles of gas appeared upon each electrode, more of course at the negative one, but at the anode a yellowish deposit grew and spread uniformly out toward the opposite electrode, a dark ridge was built up about equidistant all along the electrode, and became more definite till the band widened out on either side, and concentrated at a point immediately opposite the cathode. Very peculiar movements could be made to take place in this band by making and breaking the circuit rapidly. Photographs showing these changes are given by the author. A drop of litmus used to stain the milk showed that an acid and an alkali were formed at the anode and cathode respectively, evidently accounting for the deposition of caseine at the former. The action would appear to be similar to that which takes place when milk is exposed to air for some days; lactic acid is formed, which throws down the caseine. By electrolysis, however, the action can be started and stopped as desired, so that any portion or all of the caseine can be removed from the milk.

Next a small vessel was divided into three compartments by means of two porous partitions, and the effects recently described by M. Andréoli were tried. About 10 cub. cm. of milk were poured into the center division, while the anode and cathode compartments contained a solution of sodium chloride. On the passage of the current a deposit was formed in the center compartment on the side of the partition separating it from the anode. When all three compartments contained milk, the deposit occurred on the sides of both partitions furthest from the anode. Under these circumstances it seems that an action takes place in the milk in the center compartment. No deposit took place upon metallic plates immersed in the milk in either case. Some experiments upon the preservation of milk by means of this electrical withdrawal of a portion of its caseine were made, but with no success so far. Mr. Swinburne mentions, however, that milk can be sterilized electrolytically.

In conclusion, the author states that platinum is the most suitable material to use for electrodes in the electrolysis of milk, as the lactic acid formed attacks most other metals. Aluminum can, however, be used in certain cases for the positive electrode, but it is eventually dissolved, and consequently of little use for quantitative work.—The Electrician.

Field Experiments with Potatoes

made by the New Jersey Agricultural College are, briefly, as follows: The results of recent field experiments with Irish and sweet potatoes are at least suggestive. Manure increases the scab and soil rot. Lime increases the scab, but diminishes the soil rot and tends to make sweet potatoes round. Kainit diminishes the scab, but increases the soil rot. Sulphate of copper diminishes both scab and soil rot. Corrosive sublimate diminishes greatly the scab and soil rot. Sulphur is, all things considered, the best remedy for the scab and soil rot that the experiments suggest.

For the Irish potatoes, it is suggested that the flowers of sulphur, costing two or three cents a pound, be used with the freshly cut seed in the hopper of the planting machine.

For sweet potatoes the sulphur might be mixed with five times its bulk of fine earth, and a spoonful of the mixture placed in the hill just before setting out the plant.

© 1895 SCIENTIFIC AMERICAN, INC.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR FENDER.—Theodore Cocheu, Brooklyn, N. Y. The platform of this fender, covered with wire netting, is pivotally held in brackets under the forward end of the car, the fender extending forward horizontally at a slight distance above the track. At the front end of the fender, and extending somewhat beyond it, is a guard rail, with rearwardly extending side rods, which are adapted to be pushed inward by an object coming in contact with the guard rail, and a catch is thus released by which the fender is dropped down upon the track, the lower side of the fender having shoes adapted to ride upon the rails. The fender may also be dropped to its lowermost position by the motorman or gripman pressing upon a foot lever.

CAR COUPLING.—James D. McDonald, Port Morien, Canada. This is a coupling adapted to couple with another one like itself or with the old fashioned link and pin coupling, holding the link in a manner to guide it accurately into an opposing coupling, and the link being automatically fastened. Spring buffers are arranged to take up part of the shock and prevent a link from being badly bent, and the device automatically sounds a gong or alarm when a coupling is made or the cars are uncoupled.

CATTLE GUARD.—Harvey M. Jack, Palestine, Texas. This improvement comprises sections of metallic frames and plates secured between the rails and along each side of the track, to guard a gap in the fence and keep cattle off the track, the plates having pricking points designed to prick the legs of the stock at or above the top of the hoof. Adjacent to the points or prongs are inclined surfaces on which the feet of stock will slide to bring the prongs in contact with their legs.

Electrical.

MEASURING INSTRUMENT.—Herschel C. Parker, Brooklyn, N. Y. To accurately indicate the volts and amperes of an electric current this inventor provides a coil of wire pivotally mounted between the poles of a permanent magnet, and adapted to move an index moving over a scale graduated to indicate either volts or amperes, or both. The coil is adapted to be placed in circuit with a resistance, to ascertain the voltage of a current, and to ascertain the amperage it is included in a shunt or branch circuit from the main circuit, the resistance being then cut out of circuit with the coil.

TIME ALARM ATTACHMENT.—Max Wolff, New York City. Combined with the alarm post of a clock or similar mechanism, according to this improvement, is an electrical circuit including a generator and an alarm, and having flexible terminals connected with the post and normally out of contact with each other. The terminals are twisted by the turning of the alarm post, the terminals being thus crossed and brought into contact with each other to close the circuit.

Mechanical.

FRICTION GEAR.—Charles and Harry Burgon, Malin Bridge, England. This is an improvement for transmitting motion from a line of shafting to flexible or jointed shafts by which shearing or clipping machines are driven. A peripheral friction gear is employed, the driven pinion being on a counter shaft parallel to the main shaft, the driving pulley and pinion being also parallel to the main shaft, and of sufficient breadth to permit lateral deviation of the driving pulley. The first member of the flexibly jointed transmission shaft is coupled to the pinion shaft by a universal toothed coupling which allows one shaft to assume any angle relative to the other through a range of 180°.

Miscellaneous.

TIRE INFLATOR.—Donald McKenzie, London, Canada. This is a device for automatically inflating the pneumatic tires of bicycles and velocipedes, and comprises an air pump of novel character arranged upon the inner part of the wheel rim, and having a pivoted arm with suitable tread projecting outwardly from the tread of the tire, to come in contact with the ground at each revolution of the wheel, and thus automatically keep the tire fully inflated, a safety valve preventing too high pressure.

VEHICLE STARTING MECHANISM.—Auguste M. G. de la Rochefontenilles, Paris, France. According to this improvement clutch boxes loosely mounted to turn on the rear axle and embracing the wheel hubs with spring-actuated clutch dogs are flexibly connected with one arm of an elbow lever whose other arm is connected with the draught mechanism, the arrangement relieving the horses of the sudden strain necessary to put the vehicle in motion, and the starting mechanism ceasing to act when the wheels have acquired the velocity they would have with the draught applied directly to the axles.

ELEVATOR AND DUMPING DEVICE.—Ferris J. Nowlin, Guilford, Ind. To elevate a loaded vehicle and dump the contents into a car or as required, this inventor has devised a portable device readily operated by horse power, the vehicle being returned by gravity to receive another load. The improvement comprises a sill frame and an upright frame with inclines, in combination with a two-part sectional hinged traveling frame operated by link bars and rope and pulley connections. The whole apparatus may be loaded on wagons for transportation or compactly stored.

SAFETY CATCH FOR ELEVATORS.—John S. Chase, Lansing, Kansas. To securely hold the cage of freight or passenger elevators in case of accident to the hoisting device this inventor provides a simple arrangement of a cam adapted to engage with its cam surface the guide posts for the cage, the cam being on a shaft turning on the cage, while a spring-pressed arm on the shaft is connected with the hoisting cable. Should the cable break or become slack the cams would be instantly thrown in contact with the guide post to lock the cage so that it could not descend.

BOOK BOARDING APPARATUS.—John Ring, Washington, D. C. This invention provides a simple mechanism for book binders' use by which to accurately bind and stop the boards and books in proper relation in piling. It comprises a base frame with front and rear guideways, a carrier in the front guideway having an adjustable end stop, there being underlying supports adjustable on the front guideway and having extensible sections, while side stops movable in the rear guideway have adjustable stop portions, with other novel features. It is designed that with this improvement an inexperienced person shall do more and better work than a skilled workman in the old way, the machine automatically gaging the books and boards as the piling proceeds.

PROTECTING METALLIC SURFACES.—Marion D. Fleming, Butte, Montana. For the protection more especially of pipes from corrosion by mineral waters or air contaminated with corrosive impurities, according to this invention, the metal is freed from grease, and two coats applied of a composition containing powdered silica, powdered litharge, powdered asbestos, powdered plumbago, liquid shellac and alcohol in proportions specified.

EYEGLASSES OR SPECTACLES.—Albert E. Butterfield, Portland, Oregon. By means of this improvement a full sized lens may be used in spectacles or eyeglasses for distant vision, while other lenses are so attached to the distance lenses that they may be brought over them, rendering the same glasses fitted for near work. When the glasses are to be used for distant vision the auxiliary glasses may be carried entirely out of the way, the adjustments being effected without the necessity of removing the glasses or spectacles from the nose of the wearer.

WINDOW FASTENER.—Ewing Eaches and Robert M. Kerr, Louisville, Ky. A rotatable bolt is, according to this improvement, mounted in the meeting rail of the lower sash, the bolt having a crank arm on its inner end and a handle on its outer end, and a slotted plate is secured over a recess in the meeting rail of the upper sash, the slot extending downward from the upper edge of the plate and having an upwardly curved lower end. The fastening is simple and inexpensive, may be quickly applied and does not detract from the appearance of the sashes.

AXLE LUBRICATOR.—Jesse D. Lyon, Higginsport, Ohio. This invention provides a simple and durable device for lubricating the axle from a reservoir held on the hub, the reservoir being formed at the end of the hub by the hub band and a cap. The oil is fed to the spindle by capillary attraction, aided by the motion of the bearing surfaces and by centrifugal action, due to the rotary motion of the boxing.

BEDSTEAD IRON.—Edwin F. Tilley, New York City. For rigidly attaching tubular or other iron bedposts to the side rails this bedstead iron is made in two sections, one having a rib on its outer face and adapted to be secured to the side rail of the bedstead, while the other section has a groove receiving the rib of the first section and a second groove receiving the post, the two sections being bolted together.

COVER FOR COOKING VESSELS.—William C. Mapledorum, Fort William, Ontario, Canada. This cover has an angular pivoted handle, the lower or horizontal member of the handle engaging the cover when its other member is in an approximately vertical position. The improved cover is designed to remove the danger of burning or scalding when handling a heated pot or pan to pour out hot or boiling contents.

NON-REFILLING BOTTLE.—John N. Adams and Wilton F. Jenkins, Richmond, Va. This bottle has automatic shifting valve or stopper devices which, when the bottle is held with its neck uppermost, will close off the outlet, and when the bottle is tilted will shift to allow the contents to freely flow out. The neck of the bottle has a contracted valve seat in which is held a gravity valve and keeper, together with a supplemental keeper consisting of a spring ring member and a central flexible portion. This valve device can be added to the bottle without materially increasing the cost of its manufacture.

Designs.

COAL SCUTTLE.—John W. Feeny and Roe Reilly, Elmira, N. Y. This scuttle has a flat black rising above the body of the scuttle, the projecting upper end flaring.

CUFF HOLDER.—Louis P. Kleiderer, Henderson, Ky. This device has a wavy shank portion, at each end of which is a laterally projecting pin.

CHUCK FOR HAT BLOCKS.—Ferdinand Herbin, Amesbury, Mass. This chuck has thickened side portions with beveled inner sides, there being openings in the depressed central part of the plate and opposite peripheral recesses in the thickened side portions.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ENGINEERING CONTRACTS AND SPECIFICATIONS. Including a Brief Synopsis of the Law of Contracts and Illustrative Examples of the General and Technical Clauses of Various Kinds of Engineering Specifications. By J. B. Johnson, C.E. New York: Engineering News Publishing Company. 1895. Pp. 417. 8vo. Price $4.

Since custom has laid on engineers and architects the duty of writing specifications and contracts, it is well for them to know something of the legal ground they are forced to traverse. The leading American engineering schools have long needed a text book on the subject of the law of contracts and engineering specifications. In the absence of any such text, this department of engineering practice has received scant and meager treatment at the hands of these schools. This work has been written primarily to serve the purpose of a text book. The author is professor of civil engineering at Washington University, St. Louis, Mo., and has imparted instruction on the subject of the book for many years. The value of this work, with its wealth of technical clauses and forms, will be apparent to all engineers and architects.

STENOTYPY, OR SHORTHAND BY THE TYPEWRITER. By the Rev. D. A. Quinn. Providence: The American Book Exchange. 1895. Pp. 55. 8vo. Price $1.50.

This work gives the details of a system the principles of which can be learned in a few hours, and words may be written with a speed equivalent to two and one-half times that of the ordinary typewriter. In this system a typewriter is used. It is based on phonetics, but instead of arbitrary letter or word signs, the letters of the Roman alphabet, with figures and stops, are utilized. By a judicious collocation of capitals and letters, as also figures and stops, a complete system of shorthand has been devised.

THE CENTURY MAGAZINE. May, October. 1895. New York: The Century Company. Gilt cloth. Pp. 960. Price $3.

Such a rich, beautiful, highly instructive and exceedingly interesting volume as six months' bound numbers of the Century Magazine make can hardly be realized by those who do not see it in this form, but simply read the separate numbers as they appear from month to month. The bound volumes are also worth a place on the drawing room table for a few weeks, before being placed on the library shelves, and all good libraries should have these volumes. The most important serial is Professor Sloane's Life of Bonaparte, begun in November, 1894, a work which has thus far given large promise of being the most complete and best balanced of all the accounts thus far put forth of the life and character of the great Corsican.

SPECIAL CONSULAR REPORTS. Highways of commerce. The ocean lines, railways, canals and other trade routes of foreign countries. Washington: Issued from the Bureau of Statistics, Department of State. 1895. Pp. 763. 8vo, maps.

RECEIVED.

PHYSICAL, INTELLECTUAL, AND MORAL ADVANTAGES OF CHASTITY. By Dr. M. L. Holbrook. New York: M. L. Holbrook & Co. Pp. 120. Price $1.

SCIENTIFIC AMERICAN BUILDING EDITION.

DECEMBER, 1895.—(No. 122.)

TABLE OF CONTENTS.

1. Elegant plate in colors showing a residence in the Colonial style recently erected at East Orange, N. J., at a cost complete of $11,000. Three perspective elevations and floor plans, also an interior view. An excellent design well treated. S. W. Whittemore, architect, East Orange, N. J.
2. A Colonial house at Madison, N. J. Perspective elevation and floor plans. Cost complete $5,500. Architects, Messrs. Child & De Goll, New York City.
3. A Colonial dwelling at Montclair, N. J. Two perspective elevations and floor plans. Architect, W. E. Bloodgood, New York City. A unique design.
4. Two perspective elevations and floor plans of a house recently erected at Brick Church, N. J., at a cost of $2,700 complete. A pleasing design. Architect, Mr. F. R. Hassman, Orange, N. J.
5. View of the new City Hall, Philadelphia, which has been erected at a cost of over $20,000,000. The building is of white marble and covers four and a half acres. Is absolutely fireproof. The height of this building is 547 feet 3½ inches, being, with two exceptions, the highest building on the earth. The exceptions being the Washington Monument and the Eiffel Tower. The next highest building on earth is the Cologne Cathedral, which is 510 feet.
6. View of the facade of the magnificent new Boston Public Library, Boston. Architects, Messrs. McKim, Mead & White, New York City.
7. Residence at Bensonhurst-by-the-Sea, L. I. Two perspective elevations and floor plans. Cost complete, $8,500. Architect, S. S. Covert, New York City.
8. Perspective elevations and floor plans of a cottage at Oakwood, S. I., recently erected at a cost of $2,800 complete. An attractive design.
9. Miscellaneous Contents: Testing house pipes and drains.—A combination bathtub and washstand, illustrated.—The permanence of modern dwellings and public works.—An improved steam and hot water heater, illustrated.—Moving a large factory.—How to fix paper on drawing boards.—A quick water heater, illustrated.—Improved toilet room fixtures, illustrated.—A single track parlor door hanger, illustrated.—An improved furnace grate, illustrated.—Cements in mason work.—An improved furnace, illustrated.—A regenerative gas heater, illustrated.—Improved woodworking machinery, illustrated.

The Scientific American Building Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates and fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

For pumping engines. J. S. Mundy, Newark, N. J.

"U. S." metal polish. Indianapolis. Samples free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Dynamo castings. The E. M. Wks., Ronceverte, W. Va.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Wanted—A competent draughtsman who has had experience on small machine work. Address, stating experience and salary expected, A. R. S., box 773, New York.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6677) W. H. B. says: What preparation is best for tanning cat and other small hides with the fur on, so that the skin will be soft and yet strong? A. Supposing the skins are dry, they should be softened throughout by soaking in pure water; soft water is best, but any ordinarily pure water may be used, and care must be taken that the skins are thus soaked only a sufficient time to soften them. Then clean off any bits of flesh that may remain on the flesh side, rinse all well, shake off the loose water, and gently stretch out and tack on a board, flesh side up. Then sprinkle with a mixture of powdered alum and salt, about two-thirds alum and one-third salt, enough to just cover every part. As the skin dries it takes up the mixture, but if any be left on the surface the second day, sprinkle on a little more water, otherwise put on more alum and salt, and sprinkle. Two to three days should be sufficient for such small skins, the idea being to give the skin all the alum and salt it will take up, while in a moist condition. This tawing process makes the hair firm, a gentle rubbing and beating softens the flesh side, and it is preserved from decay, although tawed skins are never calculated to stand much wetting. This process is well adapted for all small skins, although those which are heavier require more time, and the flesh sides are sometimes folded together, and the skins rolled up. When the skins are freshly taken off, no soaking is needed, but more care is then called for in thoroughly washing off and cleaning them, and the first application of salt and alum should be in the proportions of one-half each. It requires the judgment of a tanner to deal with skins in a dry state which may have become partly damaged before drying, and it requires special knowledge also to tell whether a dry skin is so damaged.

(6678) P. W. J. says: Can you give me some information regarding the nature of alloys? A. The following is from Hiorn's "Mixed Metals": "When two or more metals are caused permanently to unite, the resulting mixture is termed an alloy. When mercury is an essential constituent, the mixture is termed an amalgam. The general method of effecting combination is by the agency of heat, but with certain soft metals true alloys may be formed by subjecting the constituents to considerable pressure, even at the ordinary temperature. Alloys such as those briefly referred to were doubtless first discovered by the metallurgical treatment of mixed ores, from the simultaneous reduction of which alloys would be formed; or in some cases, as in ores of gold and silver, naturally formed alloys would be obtained by a simple melting process. The direct preparation of alloys by the simple melting together of the constituent metals has been enormously developed in modern times, and the attention which mixed metals are now receiving by chemists is far greater than in any period of history. Comparatively few of the metals possess properties such as render them suitable to be employed alone by the manufacturer; but most of them have important applications in the form of alloys. Even among the metals which can be used independently, it is often found expedient to add portions of other metals, to improve or otherwise modify their physical properties. Thus gold is hardened, and made to resist wear and tear, as well as to lower its cost, by the addition of copper; silver is likewise hardened by alloying it with copper; and the bronze coinage is formed of an alloy of copper, zinc and tin for similar reasons."

(6679) E. W. B. says: Can you tell me how to preserve bird skins? A. Make an incision from

© 1895 SCIENTIFIC AMERICAN, INC.

the breast bone to the vent; with a small piece of wood work the skin from the flesh. When the leg is reached, cut through the knee joint and clear the shank as far as possible, then wind a bit of cotton wool on which some arsenical soap has been put round the bone; do the same with the other leg. Now divide spine from root of tail, taking care not to cut too near the tail feathers, or they will come out. Next skin the wings as far as possible and cut off The skin will now be entirely clear of the body. The skin must now be turned inside out and the neck and skin gently pulled in opposite directions till the eyeballs are fully exposed. The whole of the back of the head may be cut off and the eyes and brains taken out and their places filled with cotton wool. The whole skin should be rubbed well with arsenical soap or plain arsenic, and the neck returned to its natural position, when, after filling the body with a little dry grass or wool, the job is done. It is very easy, and the skin of a bird is much tougher than one would suppose, though, of course, they vary, the night-jar being very thin, while humming birds are fairly tough. All the apparatus required is a sharp knife and a pair of scissors, or, for large birds, a strong pair of nippers to divide the bones. For further information see works on taxidermy.

(6680) P. W. P. says: Will you kindly give me directions for the amalgamation of zincs? A. This is accomplished in several ways. 1. By dipping the zinc in dilute sulphuric acid and then dipping the end of it into a small quantity of mercury, after rubbing the surface with a brush. 2. Dissolve 1 lb. of mercury in 5 lb. of nitromuriatic acid (nitric acid 1 part, muriatic acid 3 parts), heat the solution gently to hasten the action. When a complete solution of the mercury is effected, add 5 lb. more of nitromuriatic acid. The solution should be applied with a brush, as immersing the zinc in it is wasteful. 3. To the bichromate solution commonly used in batteries, add to every pint of solution 1 drachm of bisulphate of mercury or a similar amount of nitrate of mercury (mercury dissolved in nitric acid). By employing this method, the amalgamation of the zincs is maintained continuously after the first amalgamation, which must be accomplished by method 1 or 2.

(6681) A. F. R. says: Can you give me directions for indexing? A. A writer says: Having had to index twenty-nine thousand words, I think I have a right to speak about it. In the first place I got hold of a somewhat stiffish paper (old ledger paper is excellent); then I cut it into slips of different size (one inch by two inches will be about right). I put down on each slip a word or sentence (depending on the kind of index), with page and other reference if such is necessary. When every word or sentence which I wanted in the index was noted down, I got hold of twenty-six cigar boxes, which I lettered from a to z. I now distributed those slips into the boxes. This done, I put the contents of each box in a separate paper bag, put the now empty boxes again before me, got hold of a and distributed all slips bearing words beginning with a between these boxes, thus, aa, ab, ac, ad, etc., to the end of the chapter, This done, I got hold of aa and successively ab, ac, etc., and distributed those slips further. When arranged alphabetically, I pasted those slips belonging to a in proper order on brown wrapping paper. Having treated a in this way, I took hold of b, and so on to the end of the alphahet. It took me a fortnight (six hours a day) to get through with the distribution, and after that the copying took me several months.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

December 10, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising cabinet, C. H. Tebbetts ... 551,009
Aerating device, beer, M. H. Hart ... 550,968
Amalgamating gold and silver with mercury, C. G. Collins ... 551,201
Amalgamator, Bowes & Philbrick ... 551,178
Anchor, Langley & Honess ... 551,125
Annunciator, electric sunshine, Hunt & Duenckel ... 551,284
Asphalt, dehydrating crude, C. Richardson ... 551,294
Automatic brake and safety fender, J. & J. G. Kurtz ... 551,210
Axle, carriage, R. Mannesmann ... 551,291
Back comb, W. S. Bechtold ... 551,175
Balancing mechanism, J. Warrington ... 551,149
Baling press, Brown & Gehrt ... 551,302
Banjo, G. C. Dobson ... 550,951
Bank, registering, W. G. Horton ... 550,972
Bean picker, E. E. Miller ... 550,993
Bearing, ball, Thomas & Twyman ... 551,239
Bearing, track, F. H. Richards ... 551,196
Beds, mattress holder for, E. Calkins ... 551,259
Belt, driving, I. Jackson ... 551,164
Bicycle canopy, O. M. Schmid ... 551,050
Bicycle saddle clip, E. Ward ... 551,016
Bicycle seat for children, detachable, E. W. Wilson ... 551,068
Bicycle support, M. E. Blood ... 551,344
Bicycle tube, pneumatic, H. N. Wayne ... 551,018
Bicycles, adjustable and removable handle bar for, M. B. Ryan ... 551,173
Bit. See Bridle bit.
Blackboard, W. Antony ... 551,106
Boiler. See Steam engine boiler.
Boilers, combined high and low water alarm for, G. Fiesher ... 551,159
Bolster spring, Kohnle & Keeler ... 550,980
Bond or connector, A. G. Carlson ... 550,941
Book holder, W. G. Brownell ... 551,179
Book rest, I. F. Brown ... 551,256
Boot or shoe, H. Hottinger ... 551,281
Boring and mortising machine for wood articles, W. Ritter ... 551,171
Bottle, Sterry & Murphy ... 551,339
Bottle, internal ball valve, F. R. H. Thomas ... 551,102
Bottle, non-fillable, J. L. Wolf ... 551,069
Bottle stopper, F. S. Perrin ... 551,336
Bottle stopper, antirefilling, Fischer & Micheau ... 551,273
Bottle washing machine, A. Rouse ... 551,048
Bow for stringed instruments, P. Stark ... 551,058
Box. See Match box. Signal box.
Bracket. See Dental bracket. Door bracket.
Braiding machine, G. E. Freeman ... 551,184
Brake. See Automatic brake. Car brake. Wagon brake.
Bridge, draw, M. G. Schinke ... 551,004
Bridle bit, A. Eastwood ... 551,267
Bronzing liquid for stencil printers, S. H. Sharp ... 551,327
Buffing or polishing appliance, H. A. Webster ... 551,019
Buffing wheel, H. Carmichael ... 550,942
Bung and tap, G. W. Jackson ... 551,286
Burner. See Vapor burner.
Burner, E. Galtier ... 550,961
Burning fine fuel, apparatus for, W. M. Russell ... 551,098
Button, Flagg & Carpenter ... 550,957
Button drilling machine, M. Chernic ... 551,261
Cable reeling machine, O. P. Briggs ... 551,255
Calorimeter, R. C. Carpenter ... 550,943
Car brake, railway, J. Gibbons ... 550,962
Car coupling, A. Atkinson ... 551,249
Car coupling, H. R. Dore ... 550,952
Car coupling, G. A. Lyncker ... 551,128
Car coupling, W. P. Nye ... 551,091
Car coupling, J. T. Price ... 551,094
Car coupling, C. E. Ward ... 551,015
Car, dumping, F. V. Culver ... 551,077
Car fender, P. Long ... 551,217
Car fender, W. Purling ... 551,231
Car fender, F. B. Scaife ... 551,197
Car fender, Vaders & Smith ... 551,241
Car fender, S. B. Willis ... 551,328
Car heater drain mechanism, R. M. Dixon ... 551,182
Car seat, reversible, W. M. Norcross ... 551,326
Car, street, W. Robinson ... 551,047
Card list or index, C. F. Lomb ... 550,984
Carpet holder, Pearson & Kehoe ... 551,228
Case. See Ticket case. Vial case.
Cash register and indicator, F. H. Seymour ... 551,051
Casting water wheels, apparatus for, H. Croft, Jr. ... 550,948
Cell cases, machine for making, H. F. Smith ... 551,338
Chair. See Rocking chair.
Check loops, machine for manufacturing, W. E. Villinger ... 551,297
Cherry stoner, E. Zeiffuchs ... 551,246
Chocolate dipper, C. Gousset ... 551,276, 551,277
Chuck for holding flanged bodies, F. H. Flottmann ... 551,117
Chute and underfire, combined ash, A. Stretton ... 551,174
Cigarette machine, M. Kirshner ... 551,332
Cleaner. See Dish cleaner. Grain cleaner.
Cleat for electric wiring, J. R. Hemphill ... 551,032
Clock, electric, B. Franklin ... 550,959
Clothes drier, T. P. Snyder ... 551,008
Clothes line, J. R. Phelps ... 551,045
Clothes line pulley, J. J. Leuzinger ... 551,214
Clothes line support, J. B. Allen ... 551,105
Clothes line support, W. W. Case ... 551,260
Clutch, friction, W. A. Leonard ... 551,213
Coal dust feeding appliance, F. De Camp ... 551,074
Coal powder from peat, etc., apparatus for manufacturing, N. K. H Ekelund ... 551,113
Coat hook, J. D. C. Knapp ... 551,189
Coffee roaster, Otten & Henneman ... 550,999
Collar, horse, G. H. Mackay ... 551,085
Comb. See Back comb.
Combination lock, J. Bamert ... 551,300
Combing machine, Hoyle & Colburn ... 551,282
Commutator brush, Hirsch & Meminger ... 551,033
Commutator compound, antisparkle, J. R. Davis ... 551,263
Compass, L. Sirieix ... 551,295
Condenser, steam, H. A. Wheeler ... 551,299
Condensers, cleaning surface, Tweedy & Saunders ... 551,012
Copy and book holder, F. D. Kees ... 551,322
Corer, appie, O. Sayre ... 551,099
Cotton, feeding mechanism for machinery for opening, cleaning and preparing, J. Bardsley ... 551,108
Couch, folding, J. Boyd ... 551,253
Counting machine, A. Cox ... 551,180
Coupling. See Car coupling. Thill coupling. Wagon front coupling. Wagon rear coupling.
Crank, winding, F. J. Bernard ... 551,177
Crusher. See Stone crusher.
Crusher and pulverizer, Lenz & Paynter ... 551,127
Cue trimmer, J. B. Olney ... 551,195
Cuff holder, W. V. Snyder ... 551,007
Cultivating and planting apparatus, E. E. Hartzell ... 551,207
Curtain pole and shade bracket, J. A. Gilfillan et al ... 551,080
Curtain rod holder, sash, A. Krah ... 551,124
Curtains and shades, combined support for, A. Akeson ... 551,199
Cutter. See Milling cutter. Pipe cutter. Rotary cutter.
Cycle transmitting mechanism, G. Beekman ... 550,938
Dental bracket, T. G. Lewis ... 551,190
Derrick head, D. Cram ... 551,155
Desk top, adjustable, F. W. Hill ... 551,121
Dish cleaner, Finlay & Wilson ... 551,272
Dish cleaner basket, M. Stone ... 551,059
Display stand or cabinet, A. W. McGowan ... 551,138
Door bracket, sliding, E. Y. Moore ... 551,132
Door, storm and screen, O. C. Mueller ... 550,995
Draughting sheet, mounted, W. E. Sawtelle et al ... 551,003
Drawing knife, W. H. Gould ... 550,964
Drier. See Clothes drier.
Drill. See Rock or coal drill.
Drill, W. J. Pearce ... 551,227
Drums, soot removing device for heating, E. Fales ... 551,271
Drying cylinder, J. Mandot ... 550,988
Dust collecting machine, H. J. Livergood ... 551,216
Egg boiling apparatus, Fundinger & Nessi ... 551,274
Egg separator, J. E. Nash ... 550,998
Electric controller, S. H. Short ... 551,053, 551,054
Electric plant switch, A. H. Lucas ... 551,170
Electric switch, J. E. Criggal ... 551,203
Elevator controlling device, J. D. Ihlder ... 551,034
End gate, wagon, A. R. Maguire ... 550,987
Engine. See Steam engine.
Entrails, machine for cutting and cleaning, G. A. Lowry ... 550,986
Explosion motor, Kingsland & Sanger ... 551,036
Explosives, apparatus for making, Converse & Bernadou ... 551,306
Eyelet, Force & Parenteau ... 550,958
Eyelet heads, machinery for and method of covering, Force & Parenteau ... 551,079
Fan, Cochran & Brant ... 551,330
Fastening device, W. R. Woodworth ... 551,050
Feedwater regulator, J. J. Lawler ... 551,333
Fence machine, wire, C. W. Holm ... 551,280
Fence weaving device, W. F. Beals ... 551,153
Fence weaving machine, wire, C. L. & M. Ewing ... 551,204
Fender. See Car fender.
Fifth wheel, vehicle, T. A. Watson ... 551,017
File, temporary, W. H. McMillan ... 551,223
Filter plate, L. A. Enzinger ... 550,955
Filter, water, A. H. Kohlmeyer ... 550,979, 551,323, 551,324
Filtering apparatus, water, J. H. Blessing ... 550,939
Firearm, magazine, A. G. Nolcken ... 551,143
Fireproof floor and ceiling, W. H. Brown ... 551,258
Fire sprinkler, automatic, J. T. Hill ... 551,162
Fishing tool, Lambert & Guiler ... 551,211
Flag or banner, M. Ernst ... 551,158
Flexible joint, D. W. Magee ... 551,194
Food extract, milk, C. Morth ... 551,134
Fowl decapitator, H. J. Huddle ... 551,283
Frame. See Quilting frame.
Furnace. See Smelting furnace.
Furnace, J. Moran ... 551,133
Furnace, H. Stanton ... 551,057
Furnace, A. L. Thorn ... 551,240
Furnace grate, E. Fales ... 551,269
Furnace or stove grate, E. Fales ... 551,270
Furniture base, A. C. Johnson ... 550,977
Garbage, apparatus for removing, W. Goetz ... 550,963
Garbage cremating apparatus, C. A. Wentworth ... 551,342
Gases at elevated temperatures, apparatus for treating substances with, L. Mond ... 551,221
Gaseous and liquid compounds, apparatus for separating constituent parts of, F. Windhausen ... 551,023
Gate. See End gate. Railway crossing safety gate.
Gate, A. Yates ... 551,245
Glass faced tile, brick, etc., W. Duxbury ... 550,954
Glove, ball player's, A. B. Decker ... 550,949
Golf club, W. T. Jennings ... 550,976
Grain cleaner, O. M. Sweet ... 551,238
Grate, G. W. & H. S. Bennett ... 551,252
Grate bar, Ludington & Percival ... 551,353
Grinding machine, P. J. Westphal ... 551,243
Guns, means for locking barrels to frames of breakdown, E. E. Bennett ... 551,251
Harness attachment, W. A. Brunemeier ... 551,303
Harvester, bean, W. Snure ... 551,055
Hat fastener, F. W. Grundmann ... 551,313
Hay rack, metal, G. A. & G. E. Nidy ... 551,225
Hinge, spring, M. S. Field ... 551,030
Hod, W. Mullen ... 550,996
Holdback, thill, P. S. Van Wagner ... 551,013
Hook. See Coat hook. Ladder hook.
Horse rake, D. Maxwell, Sr ... 551,039
Horses, boot or other holder for, J. M. E. Morrill ... 551,135
Horseshoeing apparatus, J. H. Jessen ... 551,287
Howel and croze, cooper's combined, Foertsch & Wilhelm ... 551,160
Hub cap, F. Kramer ... 551,290
Hydraulic press, F. J. Dudley ... 551,350
Indicator lock, W. F. Beasley ... 551,154
Insulated electric wire joint, R. S. Kelsch ... 551,166
Insulating purposes, composition of matter for, R. N. Pratt ... 551,230
Jar cover, A. Heinemann ... 551,120
Jewelers' findings, manufacture of, C. H. Fuller ... 550,960
Joint. See Flexible joint. Insulated electric wire joint. Pipe joint.
Knife. See Drawing knife. Pocket knife.
Knitting machine loop extending mechanism, J. L. Branson ... 551,346
Ladder hook, extension, C. J. Burgedahl ... 551,073
Lamp, bicycle, J. H. Lehman ... 551,083
Lamp, electric arc, W. J. Davy ... 551,029
Lamp, electric arc, F. N. Pike ... 551,046
Lamp, electric arc, W. P. Wiemann ... 551,244
Lamp electrode, arc, T. G. Portis ... 551,337
Lamps, automatic lighting device for bicycle or other, J. H. Lehman ... 551,082, 551,084
Lamps, carbon holder for arc, H. J. Farley ... 550,956
Latch, N. Lattard ... 551,212
Lathe tool rest, K. Bauer ... 550,937
Launches, apparatus for operating vapor, F. W. Ofeldt ... 551,226
Life-saving apparatus, marine, Guest & Bates ... 551,081
Ligature receptacle, G. M. Stratton ... 551,147
Lock. See Combination lock. Indicator lock. Sash lock. Seal lock. Shutter slat lock.
Lock, G. L. Barney ... 551,151
Lock, J. W. Tatum ... 551,296
Loom shuttle box motion, T. Lynn ... 551,191
Loom shuttle box operating mechanism, Wattie & Hutchins ... 551,104
Looms, automatic pick counter for, H. W. Bosworth ... 551,345
Lubricating attachment, T. B. Nation ... 551,142
Lubricator, J. B. Miller ... 551,086
Magnet, electro, S. T. Wellman ... 551,020
Mail collection system, C. F. Munson ... 551,087
Match box, I. O. Day ... 551,156
Mattress or bed bottom, spring, Bundy & Pickett ... 551,348
Measuring bust, garment, W. A. & A. L. Arfvidson ... 551,248
Meat cutter's cabinet, Hutchinson & Austin ... 551,316
Metal articles, manufacture of hollow, J. A. Potter ... 551,229
Milling cutter, C. C. Tyler ... 551,064
Milling cutter and dies for making same, C. C. Tyler ... 551,063
Milling cutters, machine for making, C. C. Tyler ... 551,066
Mining cutter wheel, coal, W. J. E. Carr ... 550,944
Mining machine, E. S. McKinlay ... 551,140
Motor. See Explosion motor.
Musical instrument, J. Brand ... 551,254
Musical instrument, E. R. Kappeler ... 551,289
Mute for stringed instruments, E. Wegmann, Jr ... 551,067
Nickel ores or other materials containing nickel with carbon monoxid, apparatus for treating, L. Mond ... 551,220
Nippers and nail puller, combined, G. Laube ... 550,981
Nut lock, H. Isackson ... 550,975
Nut wrench, vehicle axle, J. Hastings ... 550,969
Oar lock, W. E. De Riar ... 551,265
Packing, metallic, J. L. Hummer ... 551,188
Pan. See Vacuum pan.
Paper board scoring machine, Brown & Birnie ... 551,257
Paper box covering machine, H. A. Inman ... 550,974
Paper box machines, cut-off for, G. W. Miles ... 551,130
Paperhanger's bench horse, C. J. Burgedahl ... 551,072
Paper fixture, toilet, E. Morgan ... 551,040
Paper registering machine, T. C. Dexter ... 550,950
Pen, fountain, W. I. Staaf ... 551,101
Pencil, lead, A. Kaiser ... 551,288
Pendulums, device for adjusting the beat of clock, F. F. Richey ... 551,234
Photomechanical printing processes, screen for, E. G. D. Deville ... 551,266
Photographic apparatus, automatic, J. Ferrer y Girbau ... 551,206
Picker. See Bean picker.
Picture frame mouldings, machine for forming, J. Gibson ... 551,205
Pipe cutter, C. F. A. Mueller ... 551,041
Pipe joint, flexible, D. W. Magee ... 551,193
Pipe wrench, G. L. Ives ... 551,285
Planter, J. W. Shore ... 551,235
Planter, hand, O. Simons ... 551,006
Plants, flowers, or trees, stake for, T. N. Parker ... 551,000
Planter, seed, G. E. Heath ... 551,187
Plow, J. J. Dewberry ... 551,078
Plow, wheeled, H. Lindestrom ... 551,215
Pocket knife, self-opening, Shonnard & Davis ... 551,052
Pocket, safety, J. P. McGuire ... 550,997
Pole, vehicle, G. S. Clark ... 550,945
Pole triangles, register for, De Neergaard & Wilhjelm ... 551,089
Press. See Baling press. Hydraulic press. Printing press. Soap press.
Press, F. J. Dudley ... 551,351
Printing machine, H. A. W. Wood ... 551,198
Printing press, R. Miehle ... 550,992
Propeller attachment, boat, A. H. Loebs ... 550,983
Pulverizer and blower, W. M. Russell ... 551,097
Pump rod, compensating, G. H. Beebe ... 551,176
Pump, spraying, A. S. & A. H. De Clercq ... 551,157
Puzzle, A. Hadlock ... 551,278
Quilting frame, J. J. Click ... 551,305
Rack. See Hay rack.
Rail bond, electric, W. H. Wiggin ... 551,021
Railway crossing safety gate, G. W. Phillippi ... 551,001
Railway, electric, R. Lundell ... 551,334
Railway, electrical conduit, J. D. Griffen ... 550,965
Railway rail lock, R. J. Catchings ... 551,349
Railway switch, B. F. Loughmiller ... 551,218
Railway switch, Samuel & Angerer (r) ... 11,518
Railway switch, underground electric, A. Rosenholz ... 551,145
Rake. See Horse rake.
Razor strop, H. F. Gray ... 551,331
Reel. See Wire reel.
Refrigerating apparatus, M. Audiffren ... 551,107
Refrigerating cupboard, Lowell & Fuller ... 550,985
Register. See Cash register.
Regulator. See Feedwater regulator. Gas regulator.
Rivets, etc., into soles, machine for forming and driving, T. Gare ... 551,118
Roaster. See Coffee roaster.
Rock or coal drill, E. S. McKinlay ... 551,139
Rocking chair, G. S. Colburn ... 551,109
Roof or floor, C. M. Jennings ... 551,352
Rotary cutter, Johnson & Keniston ... 550,978
Saddle girth fastener, A. P. Harland ... 551,314
Sash cord guide, P. Dosch ... 551,307
Sash holder, G. S. Colburn ... 551,110
Sash lock, J. A. Dillon ... 551,181
Sawbuck, A. Clymer ... 550,946
Saw, crosscut, R. E. Poindexter ... 551,144
Saw guard, L. C. Ringuette ... 551,002
Saw set, J. F. Strable ... 551,061
Scoop, weighing, N. S. Douglas ... 550,953
Screen. See Window screen.
Screw slotting machine, Hakewessell & Henn ... 551,119
Scrubbing machine, R. Hoffheins ... 550,971
Seal lock, Masten & Hughes ... 550,989
Seat support, spring, H. Park ... 551,293
Separator. See Egg separator.
Sewers, subways, conduits, etc., apparatus for constructing, H. P. McDonald ... 551,042
Sewing machine attachment for sewing carpets, F. Ames ... 551,200
Sewing machine buttonhole attachment, E. J. Toof ... 551,010
Sewing machine chair attachment, J. A. Adkins ... 551,247
Sewing machine needle threader, C. W. Kutz ... 551,325
Sewing machine work guiding device, F. W. Merrick ... 551,129
Shaping machine, involute curve, C. C. Tyler ... 551,065
Sharpener, shears, W. R. Moore ... 551,292
Sheathing and lath, combined wooden, O. R. Dahl ... 551,112
Shell for high explosives, J. G. Justin (r) ... 11,517
Shutter slat lock, window, W. Z. Brown ... 550,940
Sickle bar, J. Smith ... 551,236
Sifting apparatus, E. R. Draver ... 551,308, 551,309
Signal box, successive non-interfering, W. H. Kirnan ... 551,123
Signaling apparatus, B. J. Noyes ... 551,090
Skate with automatic fastening, H. F. Morsbach ... 551,136
Slate, H. E. Sheldon ... 551,005
Smelting furnace, electric, J. A. Vincent ... 551,014
Soap press, J. A. Tilden ... 551,062
Soldering machine, M. Jensen ... 551,122
Sole leveling machine, F. W. McArdle ... 551,222
Spring. See Bolster spring.
Sprinkler. See Fire sprinkler.
Stamp, rubber hand, W. L. Barnard et al ... 551,026
Stand. See Display stand.
Steam, apparatus for utilizing exhaust, C. Garver ... 551,031
Steam boiler, W. McDonald ... 551,137
Steam engine, W. F. & E. W. Cleveland ... 551,262
Stereotype casting and shaving machine, J. C. Breuer ... 551,071
Stereotype plate holder, A. W. Marshall ... 551,037
Stone breakers, means for lubricating bearings of, P. W. Gates ... 551,310
Stone crusher, jaw, C. L. Carman ... 551,304
Stop motion mechanism for machines for preparing slivers, W. P. Canning ... 551,028
Stopper. See Bottle stopper.
Stove, heating, P. W. Elliott ... 551,114
Stove or range, cooking, P. W. Elliott ... 551,115
Stove, range, etc., cooking, P. W. Elliott ... 551,116
Strainer, fluid W. R. Park ... 551,044
Street sweeper, W. Haywood ... 551,208
Switch. See Electric switch. Electric plant switch. Railway switch.
Switchboard system, multiple, Spencer & Wales, Jr ... 551,056
Switch stand, F. F. Culver ... 551,076
Syringe, E. L. Day ... 551,264
Syringe, F. L. Woodford ... 551,070
Tack machine, R. Hathaway et al ... 551,279
Tap screw plug, J. Lee ... 551,354
Telegraph relay, A. D. MacDonald ... 551,192
Telephone circuit, J. S. Stone ... 551,060
Telephone lines, harmonic selective signal for party, J. A. Lightbipe ... 550,982
Telephone receiver, A. C. Brown ... 551,347
Telephone transmitter, J. & H. M. Goodman ... 551,275
Thill coupling, Crosby & Keener ... 551,111
Thill coupling, Hunter & Logan ... 551,315
Thill coupling, G. J. Overshiner ... 551,092
Thill support, M. V. B. Howe ... 550,973
Thill support, J. Q. Lemmon ... 551,126
Thill support, vehicle, J. B. Miller ... 550,994
Ticket case, C. G. Edenholm ... 551,268
Tire for bicycle or other wheels, spring, Beale & Jewell ... 551,152
Tire, pneumatic, E. F. Murdock ... 551,088
Tire wheel, J. S. Copeland ... 551,075
Toluenesulfochlorids, making, P. Monnet ... 551,151
Toy, detonating, J. S. Tobitt ... 551,148
Track cleaner, A. S. Hickley ... 551,209
Trimmer. See Cue trimmer.
Trolley, D. Lippy et al ... 551,168, 551,169
Trough. See Watering trough.
Trousers, etc., fly fastener for, J. Waldner ... 551,103
Truck for barrels, etc., H. A. Kobold ... 551,167
Truss, umbilical, E. Stewart ... 551,237
Tube. See Bicycle tube.
Tubes from metallic ingots, mechanism for making, R. C. Stiefel ... 551,340
Turbine, wind, J. F. Janssen ... 551,165
Typewriter cleaning attachment, H. L. Massey ... 551,035
Typewriting machine, W. C. Ackley ... 551,343
Typewriting machine, M. G. Merritt ... 550,990
Vacuum pan, A. F. Galennie ... 551,161
Valve, P. Towey ... 551,341
Valve, A. Turnbull ... 551,011
Valve gear, G. W. Wright ... 551,024
Valve instrument, W. Harris ... 550,967
Valve mechanism, steam engine, C. Schmid ... 551,049
Vapor burner, H. Ruppel ... 551,172
Vapor generating and applying apparatus, O. S. Rhodes ... 551,233
Vehicle, S. M. Schindel ... 551,146
Vehicle running gear, R. S. Crawford ... 551,202
Vehicle spring gear, B. M. Glasgow ... 551,312
Vessels, means for raising sunken, G. H. Chappell ... 551,329
Veterinary obstetrical forceps, C. Barber ... 551,301
Vial case, B. T. Winchester ... 551,022
Voting machine, F. H. Gilbert ... 551,185
Wagon box, F. S. Ingoldsby ... 551,315
Wagon brake, F. S. Ingoldsby ... 551,317
Wagon front coupling, F. S. Ingoldsby ... 551,321
Wagon rear coupling, F. S. Ingoldsby ... 551,318
Wagon running gear, F. S. Ingoldsby ... 551,320
Wagon running gear, Neill & Kriedel ... 551,224
Washer, H. A. Otto ... 551,043
Water closet seat, H. W. Scattergood ... 551,100
Water elevators, air compressor for, G. D. Warren ... 551,298
Water wheel, Parent & Grenier ... 551,093
Watering trough, automatic, J. A. Brown ... 551,027
Weather strip, H. Ballheim ... 551,250
Wheel. See Buffing wheel. Draughting wheel. Fifth wheel. Mining cutter wheel. Water wheel.
Wheel rim and tire, T. B. Jeffery ... 551,035
Winding machine, thread, T. Hansen ... 550,966
Window, Minges & Rein ... 551,219
Window, W. Wallace ... 551,242
Window cleaning device, S. Goldner ... 551,186
Window screen, F. E. Ramsden ... 551,095
Wire coiling machine, Meyer & Commons ... 550,991
Wire, machine for forming loops in ends of, F. B. Manville ... 551,335
Wire, manufacture of galvanized, tinned, and coated, G. C. Reese ... 551,096
Wire reel, W. R. McNutt ... 551,141
Wire stretcher, J. S. Hemenway ... 550,970
Wrench. See Nut wrench. Pipe wrench.
Wrench, Gay & Heard ... 551,311
Wrench, J. G. Hill ... 551,163
Wrench, J. E. Reese ... 551,232
Yoke attachment, neck, Durkee & King ... 551,183

TRADE MARKS.

Antiseptic, H. W. Faber ... 27,455
Apples, peaches, pears, berries, and grapes, fresh, J. R. Fay ... 27,444
Bags, grain, G. M. & F. P. Mann ... 27,426
Baking powder, Cameo Baking Powder Company ... 27,452
Bicycles, Kenwood Bicycle Manufacturing Company ... 27,470
Bicycles and bicycle parts, American Buttonhole, Overseaming and Sewing Machine Company ... 27,472
Bicycles and tricycles, Black Manufacturing Company ... 27,471
Bitters, M. Blumer ... 27,436
Bloomers, S. Oppenheim & Company ... 27,416
Boots and shoes, Bloomingdale Brothers ... 27,422
Boots and shoes, Hinkle, Barbour & Company ... 27,423
Bouillon, tablets of concentrated, R. Bertrand ... 27,438
Bread and biscuits, G. F. Brunyes ... 27,447
Canned goods, Hamburgh Canning Company ... 27,443
Cheese, C. Baumert ... 27,446
Coffee substitutes, Kathreiner's Malzkaffee-Fabriken mit Reschrankter Haftung ... 27,437
Cotton piece goods, Kuhnhardt & Company ... 27,419
Cycles, Fenton Metallic Manufacturing Company ... 27,469
Disinfectants and antiseptics, Schulke & Mayr ... 27,456
Disinfecting fluid, A. P. Beck ... 27,457
Drinks, powder for hygienic, R. Bertrand ... 27,435
Electrical supplies, Electric Appliance Company ... 27,468
Evaporating preparations for purifying air and receptacles and apparatus for same, Cre-Ozone Company ... 27,453
Flour, wheat, Blanton Milling Company ... 27,448
Flour, wheat, Gardner, Seymour & Company ... 27,449
Flour, wheat, G. C. Gochnauer ... 27,450
Flour, wheat, Pugh & Kendig ... 27,451
Gin, J. P. Baiter ... 27,432
Gin, imported, S. Streit & Company ... 27,431
Gloves and mittens, both leather and knit, and knit goods generally, Kalamazoo Knitting Company ... 27,424
Insecticides, E. S. Brewster ... 27,458
Insecticides, C. R. Ober ... 27,459
Lace goods, I. Modry & Company ... 27,417
Laces, boot and shoe, Firm of W. Paton ... 27,420, 27,421
Mineral and carbonated waters, Taft & Greenleaf ... 27,434
Mineral water, C. W. Steele ... 27,433
Music form, songs in sheet, T. A. Metz ... 27,415
Peptone of beef, Liebig's Extract of Meat Company ... 27,439 to 27,442
Perfumery, Winkelmann & Brown Drug Company ... 27,462
Pickles, W. L. Hickok & Company ... 27,445
Punch, arrack, C. A. Lindgren & Company ... 27,430
Rasps and files, Stokes Brothers Manufacturing Company ... 27,474
Scales, weighing or measuring, Buffalo Scale Company ... 27,464
Scarfs, Ballin & Bernheimer ... 27,425
Snuff, H. Coyne ... 27,427
Soap, Christopher Lipps Company ... 27,460, 27,461
Steel bars, T. C. Burrows ... 27,473
Stiffening material, T. Hanna ... 27,418
Stoves and ranges, Eclipse Stove Company ... 27,467
Tetrajodphenolphthalein, an antiseptic substance, Chemische Fabrik Rhenania ... 27,454
Tobacco, cigars, and cigarettes, smoking and chewing, L. Miller & Sons ... 27,429
Tobacco, smoking, F. W. Feigner & Son Company ... 27,428
Toys, mechanical, F. D. Pagliuchi & Company ... 27,463
Wringers, American Wringer Company ... 27,465, 27,466

DESIGNS.

Abdominal supporters, pad for, J. H. Kellogg ... 24,977
Badge, campaign, D. Roth ... 24,953
Bedstead corner post, Z. T. Jones ... 24,973
Bicycle saddle, W. I. Bunker ... 24,964
Bottle, J. L. Dawes ... 24,956
Bottle, I. Mamaux ... 24,957
Bracket, D. C. Bowen ... 24,967
Bracket, display, T. C. Blue ... 24,968
Carpet, H. Horan ... 24,978
Carpet, W. L. Jacobs ... 24,979, 24,980
Check book, W. L. Roe ... 24,970
Desk and seat, school, E. H. Stafford ... 24,975
Escutcheon, G. E. Tyson ... 24,971
Glass dish, H. T. Broden ... 24,959 to 24,961
Glass holder, drinking, J. H. Gault ... 24,962
Hair holder, A. Berlin ... 24,963
Knife cleaner, A. Watkin ... 24,969
Magnet frame, field, Jackson & Conradson ... 24,966
Musical instrument casing, P. Ehrlich ... 24,965
Paper weight, E. P. Frederick ... 24,955
Plate, C. J. Abrenfeldt ... 24,958
Sinks, etc., corner support for, L. Nichols ... 24,972
Spoons, etc., handle for, A. F. Jackson ... 24,954
Table, L. Von Grave ... 24,974
Wine room fixture, E. Ringold ... 24,976

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

© 1895 SCIENTIFIC AMERICAN, INC.

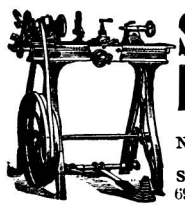
Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



Star Lathes
Foot Power
Screw cutting
Automatic
Cross Feed
9 and 12 inch Swing.
New Designs. Novel Features.
Send for Catalogue **B.**
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.

AMERICAN PATENTS.—AN INTERESTING and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002.** Price 10 cents. To be had at this office and from all newsdealers.

POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE.
SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

• LATHES AND MILLING MACHINES •
Foot or Power, for Bicycle, Model, Tool and Experimental work. Easy running. Finely finished. Send for catalogue.
W. H. MANSFIELD,
71 Court St., New Haven, Conn.

The Curtis Steam . . . . Pressure Regulator
A steam saving appliance of established value. May be used wherever necessary to control or reduce steam pressure. Its employment means a great saving in operating expenses.
☞ *Send for circular S. A.*
D'ESTE & SEELEY CO.,
29-33 Haverhill St., Boston.

Starrett's Universal Surface Gauge

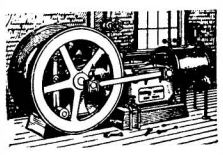
This gauge has joint at base allowing spindle and scriber to be moved back and forth and placed in any position from upright to horizontal, to reach over, back of, and underneath.
Price, No. 1, 9 inch.....$2.50. No. 2, 12 inch $3.00
" No. 3, with two spindles, 12 and 18 inches..... 3.50
☞ *Illustrated Catalogue Free.*
The L. S. Starrett Co., Manufacturer of Fine Tools, P. O. Box 13, ATHOL, MASS.

Split Die & Tap Holders for holding Machine Screw Taps and Dies used in Bicycle Plates

Four assortments for each holder, holding up to and including 14 sizes.
☞ *Send for fully illustrated catalogue.*
WELLS BROS. & CO., P. O. Box B, Greenfield, Mass

ICE-BOATS—THEIR CONSTRUCTION and Management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horsfall, M.E. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, **1.** The same number also contains the rules and regulations for the formation of ice-boat clubs, the sailing and management of ice-boats. Price 10 cents.

AIR COMPRESSORS for Machine Shops



All sizes and types.
Pohlé Air Lift Pump.
The Ingersoll-Sergeant Drill Co.
Havemeyer Building,
26 Cortlandt St., New York.
Send for Catalogue.

CONSULTATION AND ADVICE TO **INVENTORS.**
Experimental work of every description. Automatic machinery designed and built. ☞ Send for circular.
MALTBY MFG. CO., Brooklyn, N. Y.

GATES ROCK AND ORE BREAKERS
OVER 3000 IN USE THROUGHOUT THE WORLD
GREATER CAPACITY USING LESS POWER THAN ANY OTHER ON EARTH
MODERN MINING MACHINERY OF EVERY DESCRIPTION
GATES IRON WORKS DEPT T
650 ELSTON AVE. CHICAGO.

Scientific Book Catalogue
RECENTLY PUBLISHED.
Our New Catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.
MUNN & CO., *Publishers* SCIENTIFIC AMERICAN,
361 Broadway, New York.

AT A TEST

of Steam Pipe Coverings bought in open market by the State College of Pennsylvania, for the purpose of conducting a CONDENSATION TEST, our Covering gave
20% better results than - - - John's Asbestos Sponge.
20% better results than - Magnesia Sectional Covering.
27% better results than - - Carey's So-called Asbestos.
50% better results than - Manville Wool Felt Covering.
We offer it at prices to suit the times.
Agents Wanted. *Mention this paper.*
New York Fire Proof Covering Co., 121 Liberty St., N. Y.

SANITARY SOAP VASE

PREVENTS disease, waste, pilfering of soap, clogging of waste pipes, stain of marble, uncleanly soap dish.
AFFORDS each user fresh, dry pure soap.
The Only Clean, Sanitary, and Safe way to use soap.
Agents Wanted.
Sanitary Soap Vase Co.,
Aqueduct Bldg., ROCHESTER, N. Y.

MECHANICAL DRAWING

Steam Engineering (Stationary, Marine, Locomotive), Electricity, Plumbing, Architecture, Architectural Drawing, Mining, R.R. & Bridge Engin'g.
TAUGHT BY MAIL.
Students make rapid progress in learning to draw. Circular **free.** State subject you wish to study.
The International Correspondence Schools,
SCRANTON, PA.

VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
—10 SIZES.—
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

VELOCITY OF ICE BOATS. A COLlection of interesting letters to the editor of the SCIENTIFIC AMERICAN on the question of the speed of ice boats, demonstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **214.** Price 10 cents. To be had at this office and from all newsdealers.

WOODEN TANKS.
For Railroads, Mills and Manufactories.
Builders of Steel Towers and Tanks.
La. Red Cypress Wood Tanks a specialty.
W. E. CALDWELL CO.,
217 E. Main Street, Louisville, Ky.

THE M. & B. TELEPHONE.

Absolutely Non-infringing.
Absolutely Guaranteed.
Absolutely the Best Exchange SWITCH BOARDS.
Illustrated Catalogue on application Free.
☞ *Agents Wanted.*
THE U. S. TELEPHONE CONSTRUCTION CO.
131-133 S. Fourth St., PHILADELPHIA.

HELLO, CENTRAL!

Do you use telephones? If so, we can give you just what you want. Our specialty is Blake Transmitters. There is a "best" in everything, and ours are the best. We supply complete telephones or all or any of the parts to construct a telephone. Write for illustrated catalogue.
PHŒNIX INTERIOR TELEPHONE CO.,
131 Liberty St., New York.

BUY TELEPHONES
That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are BOTH GOOD.
WESTERN TELEPHONE CONSTRUCTION CO.,
440 Monadnock Block, CHICAGO.
Largest Manufacturers of Telephones in the United States

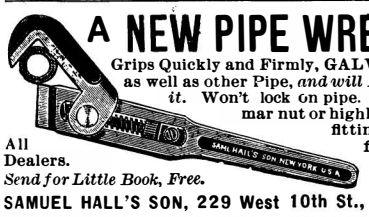
MAGNETO BELLS
ALL KINDS PRICES OF PARTS **TELEPHONES**
ELECTRICAL SUPPLIES
SEND STAMP FOR CATALOGUE. MIANUS ELECTRIC CO. MIANUS, CONN.

THE MODERN ICE YACHT.—BY Geo. W. Polk. A new and valuable paper, containing full, practical directions and specifications for the construction of the fastest and best kinds of Ice Yachts of the latest, most approved forms. Illustrated with engravings drawn to scale, showing the form, position, and arrangement of all the parts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **624.** Price 10 cents. To be had at this office and of all newsdealers.

DO YOUR OWN PRINTING
$5. PRESS for cards, circulars, &c Press for printing a small paper, $40.
Save money! Make money printing for others! Type-setting easy. Printed rules. Write for catalogue, presses, type, cards, etc., to factory.
KELSEY & CO.
Meriden, Conn.

Experimental & Model Work
E. V. BAILLARD, 106 Liberty Street, N. Y.

A NEW PIPE WRENCH



Grips Quickly and Firmly, GALVANIZED as well as other Pipe, *and will Not Crush it.* Won't lock on pipe. Does not mar nut or highly polished fitting. Other features. All Dealers.
Send for Little Book, Free.
SAMUEL HALL'S SON, 229 West 10th St., New York.

WELL DRILLING MACHINERY
MANUFACTURED BY
WILLIAMS BROTHERS,
ITHACA, N.Y.
MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER
SEND FOR CATALOGUE
ADDRESS WILLIAMS BROS. ITHACA, N.Y.

ARTESIAN WELLS.—BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **943.** Price 10 cents. To be had at this office and from all newsdealers.

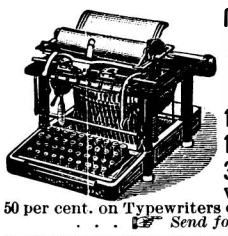
ROCK DRILLS

AIR COMPRESSORS &
GENERAL MACHINERY FOR MINING, TUNNELING, QUARRY & RAILROAD WORK.
RAND DRILL Co 23 PARK PLACE NEW YORK

National TYPEWRITER

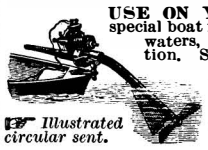
IRRESPECTIVE OF PRICE, THE BEST. Trial proves it.
Ask for descriptive booklet "E."
NATIONAL TYPEWRITER CO. 2255 Arch St., Philadelphia, Pa.

The Typewriter EXCHANGE,



1½ Barclay St., New York.
156 Adams St., Chicago.
38 Court Sq., Boston.
We will save you from 10 to 50 per cent. on Typewriters of all makes.
. . . ☞ *Send for Catalogue.* . . .

Only Portable Electric Propeller.

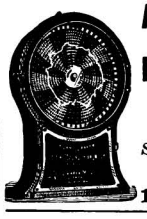


USE ON YOUR OWN BOAT. No special boat needed. Usable in shallowest waters, being movable in every direction. Shifted to another boat in few minutes. No fire, no naphtha, no danger. Thoroughly safe to user. No engineering, simply "press the button" idea. See SCI. AM., Sept. 21, 1895.
☞ *Illustrated circular sent.*
Call, See, and Test it.
FRANK S. ALLEN, 136 Liberty St., New York

SETS OF CASTINGS OF MODEL ENGINES
CATALOGUES FREE.
ALSO TOOLS, GEAR WHEELS & PARTS OF MODELS
GOODNOW & WIGHTMAN BOSTON

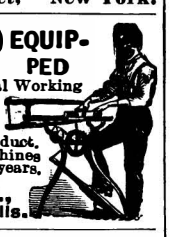
THE ORNAMENTAL IRON INDUSTRY.—Description of the method of manufacturing wrought iron into ornamental and artistic forms. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1020.** Price 10 cents. To be had at this office and from all newsdealers.

A Desirable Holiday Gift.
. . DRAPER'S . .
Recording Thermometer



Gives a correct and continuous record in ink of the temperature on a weekly chart. . . . . .
Indorsed by the U. S. Government.
Standardized and Warranted.
Write for particulars.
THE DRAPER MFG. CO.
152 Front Street, New York.

WITH YOUR WORKSHOP EQUIPPED



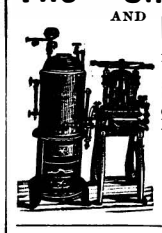
With outfits of Barnes Wood and Metal Working
☞ FOOT POWER ☜
Machinery you can successfully compete with Factories that use steam power, both in quality and profit on product. The only complete line of such machines made. Have stood the test twenty years. Send for catalogue. Address:
W. F. & JOHN BARNES CO.,
1999 Ruby St., Rockford, Ills.

EMPIRE • BOILER CLEANER • COMPOUND

We Don't Offer Gratuities, but our Circular will give you the information that will enable you to **Save Time, Trouble and Money.** *Tried, approved, and being used by the Largest Railways and Factories in the East.*
OFFICE:
Kemble Bldg., 19 Whitehall St., N.Y.

BOSTON ELECTRIC RAILWAY SUBway.—Description of a new subway system under certain streets of Boston, by means of which the electric cars will be diverted from the surface of the streets on some of the heaviest lines of travel. With 8 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1017.** Price 10 cents. To be had at this office and from all newsdealers.

The "Climax" Stereotyper AND Moulding Press Combined,



for making perfect **Celluloid Stereotypes** to be used in place of metal stereotypes. Also for making **Rubber Stamps.** Should be in use in every printing office. See SCI. AM., Dec. 30, 1893. Send for circular to
THE J. F. W. DORMAN CO.
217 E. German St., Baltimore, Md.
Manufacturers of Rubber Stamps, Vulcanizers, Stereotype Machinery and Supplies.

If you want the best CHUCKS, buy Westcott's

Little Giant Double Grip Drill Chucks, Little Giant Drill Chucks Improved, Oneida Drill Chucks, Cutting-off Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Plain Universal Lathe Chucks, Independent Lathe Chucks. Made by Westcott Chuck Co., Oneida, N. Y., U. S. A.
Ask for catalogue in English, French, Spanish or German.
FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

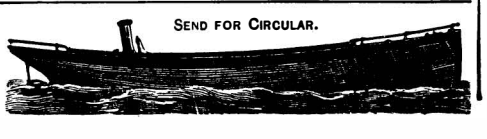
HOLIDAY GIFTS

SOMETHING LOVELY AND USEFUL.
No home is complete without our
Celebrated Combination Chairs.
Wheel Chairs

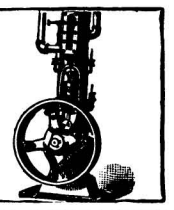
Pleases everybody, old or young, sick or well. A pleasant, life-long remembrance of a holiday gift. Prices satisfactory. Catalogue free. ☞ *Mention this paper.*
STEVENS CHAIR CO., No. 5 Sixth Street, Pittsburg, Pa.

MONITOR VAPOR ENGINE AND POWER COMPANY,
8 ERIE STREET, GRAND RAPIDS, MICHIGAN.
GASOLINE LAUNCH ENGINES AND LAUNCHES

SEND FOR CIRCULAR.



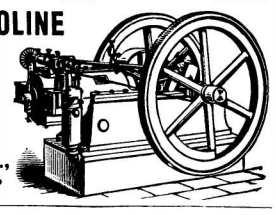
THE STURTEVANT AUTOMATIC STEAM ENGINES
HORIZONTAL & UPRIGHT
SEND FOR CATALOGUES TO
B. F. STURTEVANT & CO. BOSTON MASS.
NEW YORK, PHILADELPHIA, CHICAGO, LONDON



AUTOMOBILE CARRIAGES: THE Paris-Bordeaux-Paris Race of.—Brief account of the performance of the vehicles that obtained the prizes in the competition instituted by the Petit Journal. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1023.** Price 10 cents. To be had at this office and from all newsdealers.

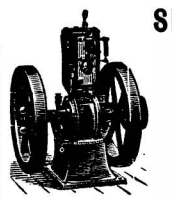
The Shipman Automatic Steam Engine
NO SKILLED ENGINEER.
Kerosene Oil Fuel.
1, 2, 4, 6 and 8 horse power.
No Extra Insurance. Efficient, Economical. Durable.
SHIPMAN ENGINE CO.
200 Summer Street.
BOSTON, MASS.

GAS and GASOLINE ENGINES.



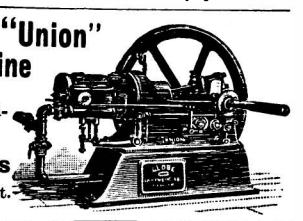
Using Natural Gas, Coal Gas, Producer Gas, and Gasoline direct from the tank. 1 to 40 H. P., *actual.*
The Springfield Gas Engine Co.,
21 W. Washington St.,
Springfield, O.

SINTZ GAS ENGINE CO.
GRAND RAPIDS, MICH., U. S. A.



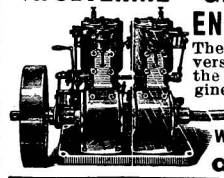
Manufacturers of the **Sintz Stationary and Marine Gas and Gasoline Engines.** Especially adapted for Boats and Electric Lighting. Runs with manufactured or natural gas—Boats and launches. Prices within the reach of all. ☞ *Send for Catalogue.*
Mention this paper.

"Pacific" & "Union" Gas & Gasoline ENGINES.



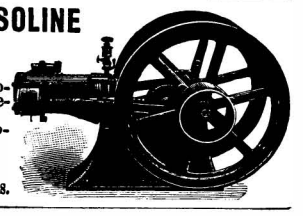
Marine and Stationary. 1 to 75 h. p. Safe, Simple, Economical.
The GLOBE GAS ENGINE CO.
Merion Av. & 49th St.
Philadelphia, Pa.

"WOLVERINE" GAS AND GASOLINE ENGINES, STATIONARY and MARINE.



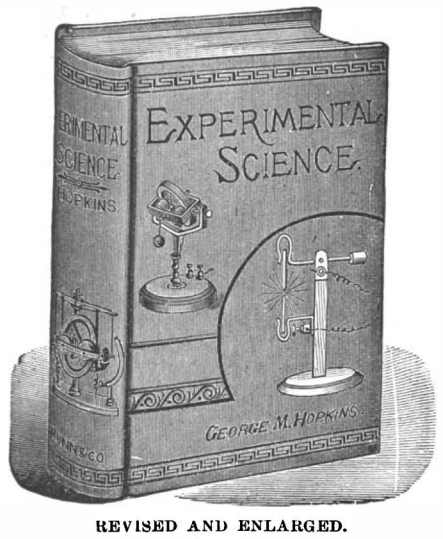
The "Wolverine" is the only reversible Marine Gas Engine on the market. It is the lightest engine for its power. Requires no licensed engineer. Absolutely safe. Manufact'd by
WOLVERINE MOTOR WORKS,
12 Huron Street,
GRAND RAPIDS, MICH.

GAS AND GASOLINE ENGINES.



½ to 15 H. P.
Suitable for pumping or any work requiring power.
Prices, etc., upon application.
PIERCE ENGINE CO.
17 N. 17th St., Racine, Wis.

Valuable Holiday Gift!
A COPY OF
Experimental Science
Seventeenth Edition.



REVISED AND ENLARGED.
120 Pages and 110 Superb Cuts added.

Just the thing for a holiday present for any man, woman, student, teacher, or anyone interested in science. In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc.; Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.
840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, $4. Half morocco, $5.
☞ *Send for illustrated circular.*
MUNN & CO., Publishers.
Office of the SCIENTIFIC AMERICAN,
361 BROADWAY, NEW YORK.

© 1895 SCIENTIFIC AMERICAN, INC.

Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

☞ Our New and Revised Catalogue of Practical and Scientific Books, 90 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

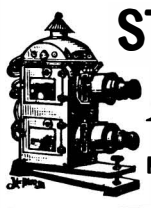
IF YOU WANT THE
CHEAPEST DYNAMO ON THE MARKET,

DO NOT SEND TO US
WE DO NOT MAKE IT.
IF YOU WANT A
FIRST CLASS
DYNAMO AT A FAIR PRICE,
WE CAN SUPPLY YOU.
ELBRIDGE ELECTRICAL MFG. CO.
ELBRIDGE N.Y.

MANAGING ENGINEER
wanted for a concern in Berlin, which manufactures Electric and Hydraulic Elevators, who can prove that he is experienced in turning out large quantities of all parts of elevators, and who is able to simplify and cheapen the method of manufacture. Please send explicit offers, state earliest time of readiness to begin and salary expected under I. L. 7981, Rudolf Mosse, Hamburg

WARRANTED
OAK · DESKS.
38 inch, - - - - $10.00
48 " - - - - - 13.00
54 " - - - - 16.00
60 " - - - - - 18.00
☞ *Send for Catalogues.*
AMERICAN DESK
and SEATING CO.
CHICAGO, U. S. A.

FIRE BRICK FOR ALL PURPOSES.
☞ *Send for Prices and Catalogue.*
BROOKLYN FIRE BRICK WORKS.
88 Van Dyke Street, BROOKLYN, N. Y.

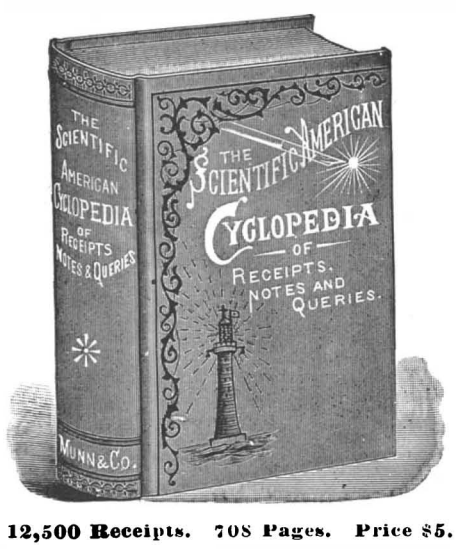

STEREOPTICONS
Lantern Slides
WE ARE MAKERS
☞ *Write for Catalogue M.*
McIntosh Battery & Optical Co.
. . CHICAGO . .

CONTRACTS WANTED.
To manufacture Hardware Specialties, Pat'd Novelties and Sheet Metal Stamping. Lang Mfg. Co., Racine, Wis.

TIME IS MONEY!
Therefore you should have one of my Desk Clocks before you. A good timekeeper in an elegant gold plated case. Sample sent for $2.00.
H. D. PHELPS, ANSONIA, CONN.

THE NEW BRISTOL COUNTER

Registers an accurate account of work done on printing presses, grain tallies, weighing, measuring and other automatic machines. Counts up to 1,000,000 and repeats automatically. Simple, accurate, durable. Special counters to order. ☞ Send for circular.
C. J. ROOT, Bristol, Conn., U. S. A.

A Valuable Book
FOR THE HOLIDAYS.


12,500 Receipts. 708 Pages. Price $5.
Bound in Sheep, **$6.** *Half-Morocco,* **$6.50.**

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

☞ *Send for Descriptive Circular.*
MUNN & CO., Publishers,
SCIENTIFIC AMERICAN OFFICE.
361 Broadway, New York.

DAIMLER MOTOR COMPANY,
BUILDERS OF
Highest Grade Single and Twin Screw Launches.

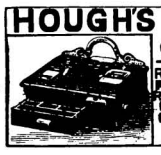
Safest, cleanest and speediest power boat built. No smoke or smokestack, no boiler, no electricity. No steam or naphtha under pressure. Run on one pint of gasoline per horse power per hour, and are under way in less than one minute. No licensed engineer or pilot.
Also Stationary Motors.
☞ **Send for Illustrated Catalogue and Price List.**
OFFICE AND WORKS, "STEINWAY," LONG ISLAND CITY, N. Y.

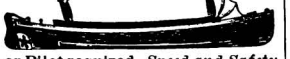
ELASTIC ROTARY-BLOW RIVETING MACHINE
For riveting together various articles of hardware, bicycle chains, agricultural implements, mechanics' tools, sewing machine attachments, and almost every class of work where riveting is required.
☞ *Write for Descriptions and Prices.*
JOHN ADT & SON,
800 State St., New Haven, Conn.

ELECTRICAL INDUSTRIES
The only Journal of **Practical Electricity**
Instructive, Interesting, Up to date
ONE DOLLAR A YEAR
Electrical Industries Pub. Co.,
Sample copy 10c. 98 Jackson St., CHICAGO

"BABY" SEWING MACHINE.
A Child can Operate it . . . .
The "BABY" is a perfect little Sewing Machine, well made and *warranted to do good sewing.* It uses regular needles, making a chain stitch. Sent complete, in wood box, upon receipt of price, **$2.50**, charges prepaid by us. A large illustration showing exact size of this latest wonder, with a sample of its sewing, sent with our catalogue of 5,000 Tricks and Novelties, upon application. Fastened by Clamp furnished with each machine, but not shown in cut.
PECK & SNYDER, 130 Nassau St., New York.

Genuine Hard Porcelain
FOR
ELECTRICAL PURPOSES.
Prices and Estimates on Special Work Given on Application.
BRUNT & THOMPSON,
Successors to HENRY BRUNT & SON, Manufacturers.
East Liverpool, Ohio.

HOUGH'S SECURITY CASH RECORDER.

ENTIRELY DIFFERENT FROM A CASH REGISTER—IT ENABLES YOU TO **TRACE** AND **PROVE** EVERY TRANSACTION—A COMPLETE RECORD KEEPER—INVALUABLE TO ALL KINDS OF TRADESMEN—THE ONLY MACHINE MADE UPON WHICH YOU **CANNOT FORGET TO RECORD** EACH TRANSACTION.
THE HOUGH CASH RECORDER CO.
SOUTH BUTLER N.Y. U.S.A.

ALCO VAPOR LAUNCH
Engine and Helm Controlled from Bow
Latest improved and only 12 to 1 Motor now ready for the market. 18 to 40 ft. Launches. 2, 3, 5 and 7 horse power.

No licensed Engineer or Pilot required. *Speed and Safety guaranteed. No Dangerous Naphtha or Gasoline used.*
Marine Vapor Engine Co., Jersey City, N. J.

MAKERS of Celebrated DOUBLE WARP BUNTING FLAGS
AMERICAN FLAG MFG. CO. EASTON, PA.
THESE FLAGS ARE GUARANTEED AS TO DURABILITY OF COLOR, STRENGTH OF MATERIAL & WORKMANSHIP & THE BEST PRODUCED
LARGEST FLAG MANUFACTORY IN AMERICA.
FLAGS SENT FOR EXAMINATION TO BE RETURNED AT OUR EXPENSE IF NOT ENTIRELY SATISFACTORY
SEND FOR CATALOGUE
447-451 CHURCH STREET, EASTON, PA.

. . . SCIENTIFIC FOUNTAIN PEN . . .
PREMIER FOUNTAIN PEN
Ready Feed. No Ink Drops. Guaranteed 14k. Gold Pen. If not equal to any $2.50 pen, money refunded. Sample sent for $1.25. *Illustrated Catalogue.*
PREMIER PEN CO., 536 Walnut St., Philadelphia, Pa.

SAVE TWO PROFITS.
Oil Heaters direct from Maker to User. Special Christmas Offer. This No. 15 Economy, formerly sold for $14.00 will be shipped complete with roller base for $9.85 freight paid. It is 42 inches high, beautifully nickeled, weighs 50 lbs. Will heat a room 30 feet square in severe weather for 1 cent an hour.
The No. 10, one size smaller, is 30 inches high, will heat a 20 foot room perfectly. Former price $8.00, now $4.50. Money refunded if not satisfactory. **Just the thing for a Christmas Present.** Agents wanted for our Diamond Knife, Shears and Skate Sharpeners. Catalogue free. Economy Mfg. Co., 60 B'way, N.Y.

THE SANDBLAST PROCESS.—BY J. J. Holtzapffel. A full description of this interesting process and of the apparatus employed; with a discussion of its capabilities and present and future applications. With 8 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1010.** Price 10 cents. To be had at this office and from all newsdealers.

PUZZLE PENKNIFE, 10c.

Best steel Blade concealed in nickel handle. Press the button and it opens. Worth 25c. as a knife and $5.00 as a puzzle. A sample of our 1000 Bargains, mailed postpaid with Cat. for 10c.
ROBT. H. INGERSOLL & BRO, 65 CORTLANDT ST, N. Y. CITY,

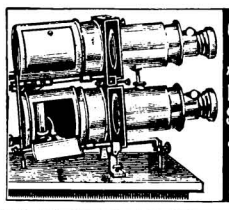
Does Your Cash Balance? Are All Credit Sales Charged?
These are two serious obstacles and can be overcome by using THE PECK CASH REGISTER
Manufactured by THE PECK CASH REGISTER COMPANY, SYRACUSE, N. Y., U. S. A.

MESSRS. MUNN & CO., Solicitors of Patents, have had nearly fifty years' continuous experience. Any one may quickly ascertain, free, whether an invention probably is patentable by writing to Munn & Co. Communications strictly confidential. A handbook of patents and how to obtain them sent free.

PATENTS

taken through Munn & Co. receive special notice in the *Scientific American.* This splendid weekly paper, elegantly illustrated, has the largest circulation of any scientific work. $3 a year. Specimen copies free.
Address MUNN & CO.,
New York, 361 Broadway.

INCUBATORS
110 Yards High Class fowls
We Warrant The Reliable
To Hatch 80 per cent. SELF REGULATING Durable, Correct in Principle. Leader at World's Fair. 6cts. in stamps for new 112 page Poultry Guide and Catalogue. POULTRY FOR PROFIT made plain. Bed-Rock Information.
Reliable Incubator and Brooder Co., Quincy, Ill.


OUR STEREOPTICONS AND OIL LANTERNS
HAVE NO EQUAL VIEWS OF ALL SUBJECTS. LOWEST PRICES.
SEND FOR CATALOGUE M
L. MANASSE
88 MADISON ST CHICAGO ILL

BRASS BAND
Instruments, Drums, Uniforms, Equipments for Bands and Drum Corps. Lowest prices ever quoted. Fine Catalog, 400 Illustrations, *mailed free;* it gives Band Music & Instructions for Amateur Bands.
LYON & HEALY, 33-35 Adams St., Chicago.

THE IMPROVED PERFECTION CAKE TINS
Loose bottoms. "Don't leak." The groove prevents that. Require no greasing.
More than a million American housekeepers now use these celebrated tins exclusively. We send 2 Round Layer Tins by mail for 35 cts. Write for catalogue showing ten styles—Round, Square and Oblong, and learn all about "The Groove." Exclusive territory to agents. **RICHARDSON MFG. CO., 7 Reade St., Bath, N. Y.**

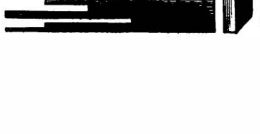
MAGIC LANTERNS
And **STEREOPTICONS**, all prices. Views illustrating every subject for **PUBLIC EXHIBITIONS**, etc.
☞ *A profitable business for a man with a small capital.* Also, Lanterns for Home Amusement. 220 page Catalogue *free.*
McALLISTER, Mfg. Optician, **47 Nassau St., N.Y.**

MEN AND WOMEN
Taught to make **Crayon Portraits** in spare hours at their homes by a new copyrighted method. Those learning my method will be furnished work by me, by which they can **EARN $8 TO $16 A WEEK.** Send for particulars
H. A. GRIPP, German Artist, Tyrone, Pa.

MUSIC BOX Latest Metal Cylinders. **CAPITAL**
Tunes unlimited. See it! Hear it!
DO YOU WISH to sell? DO YOU WANT a BARGAIN?
MAGIC LANTERNS WANTED AND FOR SALE OR EXCHANGE.
If you care to SAVE MONEY on Lanterns and Slides of our OWN MAKE or *others,* send for catalogue to
HARBACH & CO. 809 Filbert Street, PHILADELPHIA

STUDY LAW AT HOME
Systematic and thorough courses taught by able and experienced teachers. Splendid opportunity for a legal education. Send stamp for full particulars.
Chicago Correspondence School of Law, Reaper Block, CHICAGO, ILL.

Improved Acme Jacketed Kettles.
PLAIN OR PORCELAIN LINED.
Special Goods in PLAIN or PORCELAINED TO ORDER.
THE STUART & PETERSON CO.
Broad & Tatham Sts., BURLINGTON, N. J.

RED CEDAR TANKS,
CYLINDERS and CAISSONS—of Pine or Cypress—any size.
WILLIAMS MFG. CO., KALAMAZOO, MICH.
16 Murray Street, New York. | 321 Vine Street, Philadelphia, Pa.
36 So. Market Street, Boston. | 737 Monadnock, Chicago.


PROPOSALS.

PROPOSALS FOR ERECTION OF MEMORIAL Hall, West Point, N. Y.—Office of Post Quartermaster, West Point, N. Y., December 14, 1895.—Sealed proposals in triplicate will be received at this office until noon, Monday, January 13, 1896, for the construction of a Memorial Hall. Plans can be seen and forms and specifications obtained at this office or at the office of Messrs. McKim, Mead and White, Architects, 160 Fifth Avenue, New York City. The right is reserved to reject any and all proposals. J. B. BELLINGER, Captain and A. Q. M., U. S. Army.

METAL and WOOD WORKERS' TOOLS
FOOT POWER SCROLL SAWS, MORTISERS, LATHES, FORMERS, CIRCULAR SAWS and **MACHINERY.**
We carry in Stock all the
LEADING Foot Power Machinery AND LATHE **VERY LOW PRICES!**
Send 4 cents for large Illus. Catalog.
THE WILKINSON CO., 83 Randolph St., Chicago.

ICE MACHINES. Corliss Engines. Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

FOR SALE On royalty or outright on easy terms. Patent Envelope. See Sci. Am., Dec. 14, 1895. FORSYTH, FIELD & CO., Bloomington, Ind.

WANTED.—A first class Man to take charge of a medal manufacturing business. Must be thoroughly acquainted with every detail. One knowing how to make dies preferred. Address R. M., Scientific American.

BI-SULPHIDE OF CARBON for use in the arts, Killing Insects in Grain, Killing Burrowing Animals, etc. Manufactured by E. R. TAYLOR, Cleveland, Ohio

TYPE WHEELS, MODELS & EXPERIMENTAL WORK. SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST. N.Y.

TENDERS WANTED from manufacturers to manufacture at so much per thousand my patent "Baby Food Regulator" in brass, nickel plated. First order will be for four thousand. Dimensions 1⅛ in. by ⅝ in. Sample on application. A. A. DAVIDSON, Victoria, B. C., Canada.

CARBORUNDUM
HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER, CRYSTAL, WHEEL, SLAB & HONE FORM.
CARBORUNDUM CO. MONONGAHELA CITY, PA. U.S.A.

WANTED
Wire specialties to manufacture in quantities. Send samples for prices on work or tools.
L. R. Hitchcock, Watertown, Conn.

ELECTRICITY PAPERS
No. 1. How to Make a Dynamo.
No. 2. How to Make a Telephone.
No. 3. How to Make an Electro Motor.
No. 4. How to Make a Storage Battery.
Price each 10c.
Bubier Pub. Co.
Lynn, Mass.

WE DRILL WELLS
Anywhere. Any Depth. for Any Purpose.
Core drilling. 25 years experience. Write.
PALMER & DAVIS, BELDEN, OHIO.

AMERICAN AGENCY IN LONDON.
An old established London House having extensive European connections would be glad to receive Additional Agencies. Highest references. Address R. M. M., 415 Produce Exchange Building, New York.

DEAFNESS CURED! THE EAR VAPORATOR Cures
Deafness on Strictly Scientific principle. Satisfaction guaranteed. Circulars free. EAR VAPORATOR CO., 195 LaSalle St., Chicago.

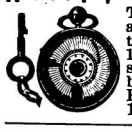
Agts want'd

BICYCLES ON EASY PAYMENTS
New or 2d hand; lowest prices; Mfrs. old reliable Sylphs and **Overlands.** We sell everywhere. Cata. free. Estab. '64.
Sylph
ROUSE, HAZARD & CO., 16 G St., Peoria, Ill.

HATCH CHICKENS by STEAM.
MODEL EXCELSIOR Incubator. *Simple, Perfect and Self-Regulating.* Thousands in successful use. Send 6c. for Illus. Cat. Circulars free.
GEO. H. STAHL, 114 to 122 S. 6th St. Quincy, Ill.

Hawkins' "Aids" to Engineers
EXAMINATIONS, with Questions and Answers, 5½ x 7½, leather, gilt edge, **$2,** postpaid. Send for FREE Descriptive Catalogue of this and other Engineers' Books. THEO. AUDEL & CO., 91 Liberty Street, NEW YORK, N. Y.

Prevents Rust
cleans, lubricates, and does not gum. For mechanics' tools, guns, bicycles, typewriting and sewing machines.
Sample of "3 in 1" sent in this oil can to introduce it for five 2c. stamps.
G. W. COLE & CO., 113 B'way, New York

Hahn's Improved Watchman's Time Detector

This Clock is adapted for 6 or 12 stations, and the keys are all different. The registering is done by numbers, ranging from 1 to 6 and 1 to 12, instead of as in the old style Time Detectors, which mark either by holes or an impression on the dial. For circulars, address **A. NANZ & CO. 118 Chambers Street, New York.**

The Scientific American

PUBLICATIONS FOR 1896.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

The Scientific American (weekly), one year	$3.00
The Scientific American Supplement (weekly), one year	5.00
The Scientific American, Export Edition in which is incorporated the Spanish Edition (monthly), one year	3.00
The Scientific American Architects and Builders Edition (monthly), one year	2.50

COMBINED RATES.

The Scientific American and Supplement	$7.00
The Scientific American and Architects and Builders Edition	5.00
The Scientific American, Supplement, and Architects and Builders Edition	9.00

Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal or express money order, or draft to order of
MUNN & CO., 361 Broadway, New York.

© 1895 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion. - 75 cents a line
Back Page, each insertion. - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

YOU can't tell a balky horse by his looks and you're just as likely to be deceived in a bicycle. There's no better guide when buying a wheel than this famous name—

Monarch

It identifies the king of wheels—it's a guarantee of strength, speed and reliability. A name that you can proudly point out to your friends.

4 models, $85 and $100, fully guaranteed. For children and adults who want a lower price wheel the **Defiance** is made in 8 models, $40, $50, $60, $75. Send for Monarch book.

Monarch Cycle Mfg. Co.,
Lake, Halsted and Fulton Sts.,
CHICAGO.
BRANCHES:
New York, San Francisco, Portland, Salt Lake City, Denver, Detroit, Toronto.

Any Boy

that will take the trouble to send for a

"Rugby" Watch

CATALOGUE, No. 61, will know more about what we have made for them in

WATCHES

than they would learn by reading a page of advertisements.

Our entire new line of Boys' Watches is elegant in designing and suits every taste.

The "Rugby" Catalogue will tell the story.

The Waterbury Watch Co.
WATERBURY, CONN.

HALF A CENTURY OF CYCLES.—AN interesting history of the cycle from its origin up to the present time. The first crank-driven bicycle. The "bone-shaker" and its successors. The tricycle. The modern wheel. Cycle building a science. Points of improvement. The pneumatic tire. A hand and foot cycle. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1012. Price 10 cents. To be had at this office and from all newsdealers.

AGENTS WANTED WRITE FOR CATALOGUE AND AGENCY. FOR FINE TOOLS IN EVERY SHOP. **C.H.BESLY & CO.** CHICAGO, ILL. U.S.A.

ALL ARITHMETICAL PROBLEMS solved rapidly and accurately by the Comptometer. Saves 60 per cent of time and entirely relieves mental and nervous strain. Adapted to all commercial and scientific computation. Why don't you get one? *Write for pamphlet.*
FELT & TARRANT MFG. CO.
52-56 ILLINOIS ST. CHICAGO.

The American Bell Telephone Company,

125 Milk Street,
Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.

Waverley BICYCLES.

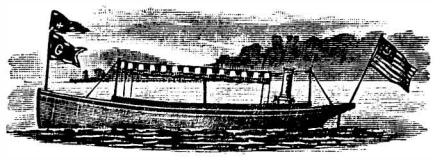
Are made in the Largest and Best Equipped Bicycle Factory in the World.

It requires a corps of scientific men to construct a bicycle that will meet the demands of the modern rider. We have the best men in the world in each department—steel experts, mechanical experts, superintendent, master mechanic, etc.—the largest and most thoroughly modern bicycle plant in the world—buy the best of high-grade material, regardless of cost, and make every part under our own roof—hence we know we are right in warranting the Waverley to be the best bicycle built in the world, regardless of price. Do you want the best? Our catalogue is free by mail.

INDIANA BICYCLE CO., Indianapolis, Ind., U. S. A.

DO YOU WANT A LAUNCH?

That you can run yourself.
That is Clean and Safe.



That requires neither Licensed Engineer nor Pilot.

Send 10 cent stamp for Illustrated Catalogue of . . . . . .

THE ONLY NAPHTHA LAUNCH.

GAS ENGINE AND POWER COMPANY, 185th St., Morris Heights, New York City.

At ¼ Price Bicycles, Watches, Guns, Buggies, Harness, Sewing Machines, Organs, Pianos, Sales, Tools, Scales of all varieties and 1000 other articles. Lists free. CHICAGO SCALE CO., Chicago, Ill.

TURBINE WATER WHEELS. SEND FOR PAMPHLET. JAMES LEFFEL & CO., Springfield, Ohio, U. S. A.

SCIENTIFIC AMERICAN

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

☞ **ESTABLISHED 1845.**

Circulation Larger than all Papers of its Class Combined.

Only $3.00 a Year, including Postage to United States, Canada, and Mexico, $4.00 a Year, including Postage to all countries in the Postal Union.

This unrivaled weekly periodical, now in its **fifty-first year**, continues to maintain its high reputation for excellence, and enjoys the largest circulation ever attained by any scientific publication. Every number contains sixteen large pages, beautifully printed, elegantly illustrated; it presents in popular style a descriptive record of the most novel, interesting and important advances in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information pertaining to these and allied subjects is given, the whole profusely illustrated with engravings.

Each issue contains a full list of inventions for which patents have been granted by the United States each week, giving the name of the inventor. The Notes and Queries department, with its full answers to various questions in mechanics and general science, will alone repay the reader for a full year's subscription.

The most important Engineering Works, Mechanisms and Manufactures, at home and abroad, are represented and described in THE SCIENTIFIC AMERICAN.

It abounds with fresh and interesting subjects for discussion, thought or experiment. It tends to improve the mind; encourages to self-exertion, activity and development; furnishes hundreds of useful suggestions for business, and for simple light and profitable occupations. It promotes Industry, Progress, Thrift and Intelligence in every community where its circulates.

THE SCIENTIFIC AMERICAN should have a place in every Dwelling, Shop, Office, School or Library. Workmen, Foremen, Engineers, Superintendents, Directors, Presidents, Officials, Merchants, Farmers, Teachers, Editors, Lawyers, Physicians, Clergymen—People in every walk and profession in life, will derive satisfaction and benefit from a regular reading of THE SCIENTIFIC AMERICAN.

As an instructor for the young it is of peculiar advantage. **Try it.**—Subscribe for yourself—it will bring you valuable ideas; subscribe for your sons—it will make them manly and self-reliant; subscribe for your workmen—it will please and assist their labor; subscribe for your friends—it will be likely to give them a practical lift in life.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT (see prospectus below) will be sent for one year, postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **seven dollars** by the publishers.

SCIENTIFIC AMERICAN SUPPLEMENT.

Published Weekly. $5.00 a Year, including Postage.

This is a distinct paper from THE SCIENTIFIC AMERICAN, but it is uniform in size with it, every number containing 16 octavo pages. THE SCIENTIFIC AMERICAN SUPPLEMENT embraces a very wide range of contents, covering the most recent and valuable contributions in Science, Mechanics, Architecture, and Engineering, from every part of the world. Every number contains several illustrations, consisting in part of important engineering works, in progress or completed, both at home and abroad. It presents the most recent papers by eminent writers in every department of science, and every number contains information useful to engineers in every department of industry, civil, mechanical, electrical, etc.

Translations from French, German and other foreign journals, accompanied with illustrations of Grand Engineering Works; also of Naval and Mechanical constructions of magnitude, projected, progressing, and completed, at home and in all countries abroad.

The most important papers read at Scientific Conventions, by the best and most profound thinkers, will be found in THE SCIENTIFIC AMERICAN SUPPLEMENT. This paper, when preserved and bound, forms a most useful encyclopedia of information, and presents a complete history of the progress of the times in the Sciences, Arts, and Mechanical Engineering. This paper contains no advertisements. A catalogue of subjects published in THE SCIENTIFIC AMERICAN SUPPLEMENT is furnished on application. This is found of great service to such as are informing themselves or making a study of any special subject in any department of science or mechanism.

Price—$5 a year, in advance: or one copy of THE SCIENTIFIC AMERICAN (see prospectus above) and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT both mailed for one year for $7, payment in advance to the publishers.

To Foreign Subscribers.—Under the facilities of the Postal Union, THE SCIENTIFIC AMERICAN is now sent by Post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British Colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, and all States of Central and South America. Terms, when sent to foreign countries, Canada and Mexico excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $8.50, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage.

THE SCIENTIFIC AMERICAN BUILDING EDITION.

Published Monthly. $2.50 a Year. Single Copies, 25 Cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly—on the first day of the month. Each number contains thirty-two pages, forming, practically, a large and splendid **Magazine of Architecture**, richly adorned with *Elegant Plates* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Costs, etc.

No other building paper contains so many new architectural plans regularly presented as the SCIENTIFIC AMERICAN. Thousands of dwellings and other buildings have been erected on the various plans we have issued during the past few years.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost *endless series of the latest and best examples* from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' announcements is also given, in which the most reliable and approved building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the **Largest Circulation** of any Architectural publication in the world.

Bound Volumes of the whole work, from beginning in 1888 to close of 1895, may now be obtained at this office, or from Booksellers and Newsdealers. Price, stitched in paper, $2.00 per volume of six months' numbers. Two volumes per year. Forwarded to any address.

Including all the separate diagrams and engravings of construction details, each volume presents not far from one thousand illustrations. The reading matter covers a large variety of useful and excellent subjects, interesting to every one. No architect, builder, contractor, engineer, or householder can afford to be without this splendid work. It is full of useful information, and its illustrations have a permanent value for suggestion and reference. It never grows old or useless.

☞ **The safest way** to remit is by Postal Order, Draft or Postal Note. Money carefully placed inside of envelopes, securely sealed and correctly addressed, seldom goes astray, but it is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., Publishers, 361 Broadway, NEW YORK.

ENGINES, Boilers and Machine Tools. New and Second-hand. *Send stamp for paper "Machinery & Supplies."* W. P. Davis, Rochester, N. Y.

The **$5.00** POCKET KODAK

EASTMAN KODAK CO.,
Sample photo and booklet for two 2-cent stamps. ROCHESTER, N. Y.

Suvio FIRE GLOBE GAS HEATER

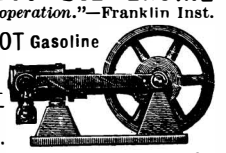
For warming rooms with ordinary gas fittings. The heat of the gas flame is increased 500 per cent. *Economical, Efficient, Pure Radiant Heat, No Odor, No Flue, No Fittings.* Prices: Black Steel, $1.00; Brass or Nickeled, $1.50. Inclose 17c. for postage. Manufactured by **SUVIO HEATER CO.,** 28 Cortlandt Street, **New York City.**

AGENTS WANTED EVERYWHERE.
☞ *Send for Descriptive Circular.*

PRIESTMAN SAFETY OIL ENGINE

"Phenomenally low in cost of operation."—Franklin Inst.

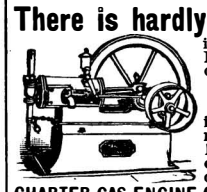
NEITHER STEAM NOR ENGINEER. Kerosene, NOT Gasoline



Economical, Simple, Safe, Automatic. For Electric Lighting, Pumping, Milling, etc.
PRIESTMAN & COMPANY, Inc.
Front and Tasker Streets, - - Philadelphia

. . . WE ARE BUILDING . . .
The Celebrated
"HORNSBY-AKROYD"
OIL ENGINE
The De La Vergne Refrigerating Machine Co.
FOOT E. 138TH STREET, NEW YORK.

There is hardly a USE OF POWER



in Factory, Mill, Store, Office, Elevator, Creamery, or Shop—or on the Farm, the
"CHARTER"
is not now filling. It is also running Boats, Well Drills, Pumps, Dynamos, Threshing Machines, etc. Of course it also uses Gasoline.
CHARTER GAS ENGINE CO., P. O. Box 148, Sterling, Ill.

Gas Engine Ignition
Our Specialty.
LEE & COLLINS,
Electrical Experts, Monadnock Bldg., Chicago.

If you want any **Rope** *For Transmission of Power*
We have furnished Rope for some of the largest Drives in the country.
WRITE TO US.
H. CHANNON COMPANY,
24-26 Market St. CHICAGO.

THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

Drawing Instruments
Engineers' Supplies

Of German, Swiss, and American make. Drawing Boards, T Squares, Colors, Inks, Tracing Cloths and Papers, Thumb Tacks, Rules, Tapes, etc.
Blue Process Papers,
THE BEST IN THE WORLD.
FROST & ADAMS,
Importers.
39 CORNHILL, BOSTON, MASS.
☞ Catalogue Free.

PERFORATED METAL OF EVERY DESCRIPTION FOR ALL USES

THE HARRINGTON & KING PERFORATING CO.
CHICAGO, ILL. U.S.A. AND 284 PEARL ST. NEW YORK

A. W. FABER

Manufactory Established 1761.

LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS.

78 Reade Street, - - - New York, N. Y.
Manufactory Established 1761.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC
WM JESSOP & SONS LD 91 JOHN ST. NEW YORK

PRINTING INKS.
The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1895 SCIENTIFIC AMERICAN, INC.